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IMPROVING READING SKILLS BY TEACHING RULES OF GRAMMAR.

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THIS PILOT STUDY ATTEMPTED (1) TO DETERMINE THOSE GRAMMATICAL CONSTRAINTS IN ENGLISH WHICH SEEM MOST SIGNIFICANTLY RELATED TO READING SKILL AND (2) TO DISCOVER WHETHER TRAINING IN THOSE GRAMMATICAL CONSTRAINTS COULD IMPROVE READING SKILL. USING CLOZE TESTS, WHICH ARE PASSAGES WITH WORDS DELETED IN SOME SYSTEMATIC FASHION, STUDENTS WERE ASKED TO REPLACE THE DELETED WORDS. THE REPLACED WORDS MUST BE PREDICTED FROM THE CONSTRAINTS EXERTED BY THE REMAINING WORDS. THE TEST RESULTS PROVIDED A MEASURE TO INDICATE WHICH GRAMMATIC CONSTRUCTIONS OR CONSTRAINTS GIVE STUDENTS THE MOST TROUBLE. ATTEMPTS TO IMPROVE READING SKILL BY TEACHING THESE CONSTRAINTS RESULTED IN ONE SUCCESSFUL AND ONE UNSUCCESSFUL EXPERIMENT. THE BULK OF THIS REPORT IS A COLLECTION OF ARTICLES RELATED TO USE OF CLOZE TESTS TO ANALYZE WORD CLASSES AND MEASURE EFFICIENCY OF WRITTEN MATERIALS IN CONVEYING NEW INFORMATION. IT WAS GENERALLY CONCLUDED THAT A KNOWLEDGE OF GRAMMATICAL CONSTRAINTS IN ENGLISH FACILITATES THE COMPREHENSION OF DIFFICULT PROSE. (AL)

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IMPROVING READING SKILLS BY TEACHING RULES OF GRAMMAR

COOPERATIVE RESEARCH PROJECT No. 2599

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CHAPTER I

INTRODUCTION

As stated in the contract, Project 2599 is a pilot study whose major objective (Objective 1) was to determine those grammatical constraints in English which seem most significantly related to reading skill and to discover whether training in those grammatical constraints could improve reading skill.

The proposal that teaching grammar could improve reading skill is based on the assumption that two sorts of knowledge are necessary in order for a reader to comprehend or learn a sentence. First, the reader must know the definitions of the words which make up the sentence (vocabulary); second, he must know the relationships between the referents of the words as signaled by the grammatical structure of the sentence. If he lacks either sort of knowledge he will fail to comprehend the sentence.

Since there are many more words in English than there are grammatical constructions, the learning of a particular grammatical construction should transfer to many more sentences than the learning of a particular word. Thus, a short amount of time spent learning the grammatical structure of English should lead to a much more dramatic improvement in reading skill than an equivalent amount of time spent studying vocabulary.

In order to make the instruction in grammar as effective as possible, one should teach only those grammatical constraints with which students have difficulty and not waste time teaching constraints that they already know. The method used to discover which constraints (or constructions) give students the most trouble was the cloze procedure (Taylor, 13).

A CLOZE TEST IS SIMPLY A PASSAGE WITH WORDS DELETED IN SOME SYSTEMATIC FASHION. A SUBJECT TAKING A CLOZE TEST TRIES TO REPLACE THE DELETED WORD BY PREDICTING THE CORRECT WORD FROM THE CONSTRAINTS EXERTED ON IT BY THE WORDS WHICH HAVE NOT BEEN DELETED. IF A GROUP OF SUBJECTS CAN REPLACE A DELETED WORD CORRECTLY THEY OBVIOUSLY MUST BE FAMILIAR WITH THE PARTICULAR CONSTRAINTS WHICH HELP DETERMINE THAT WORD. THE CLASSES OF CONSTRAINTS WHICH SHOULD BE TAUGHT TO IMPROVE READING ARE THOSE WHICH MOST FREQUENTLY LEAD TO INCORRECT REPLACEMENTS OF DELETED WORDS IN CLOZE TESTS.

CHAPTER IV CONTAINS THE FORM CLASS ANALYSIS OF CLOZE TEST DATA WHICH DETERMINED THE CONSTRAINTS WITH WHICH STUDENTS HAVE THE MOST DIFFICULTY. CHAPTER II CONTAINS ONE UNSUCCESSFUL AND ONE SUCCESSFUL ATTEMPT TO DEMONSTRATE THAT TEACHING THESE CONSTRAINTS CAN IMPROVE READING SKILL.

SINCE THIS PILOT STUDY ACCUMULATED A GREAT DEAL OF DATA ON THE CLOZE TECHNIQUE THIS DATA WAS ANALYZED IN A NUMBER OF DIFFERENT WAYS TO SATISFY THE THREE ADDITIONAL OBJECTIVES SET FORTH IN THE CONTRACT:

OBJECTIVE 2. CAN CLOZE TESTS MEASURE THE EFFICIENCY WITH WHICH WRITTEN MATERIAL CONVEYS NEW INFORMATION?

OBJECTIVE 3. IS THERE AN OPTIMAL LEVEL OF REDUNDANCY FOR CONVEYING NEW INFORMATION?

OBJECTIVE 4. WHAT IS THE MEAN CLOZE SCORE FOR DIFFERENT WORD CLASSES AND WHAT IS THE INFORMATION GAINED FOR DIFFERENT WORD CLASSES?

THE INFORMATION GAINED OR NEW INFORMATION REFERRED TO IN OBJECTIVES 2, 3, AND 4 IS DERIVABLE FROM A MODIFICATION OF THE CLOZE TECHNIQUE. IF A STUDENT IS REQUIRED TO TAKE THE SAME CLOZE TEST TWICE AND DURING THE FIRST ADMINISTRATION IS SHOWN THE WORD WHICH WAS ACTUALLY DELETED AFTER HE MAKES

HIS REPLACEMENT, ANY WORDS WHICH HE CORRECTLY REPLACES THE SECOND TIME BUT HAD INCORRECTLY REPLACED THE FIRST TIME MUST REPRESENT NEW INFORMATION WHICH THE STUDENT HAS GAINED FROM HIS FIRST EXPOSURE TO THE PASSAGE.

THE BULK OF THIS REPORT IS A COLLECTION OF ARTICLES PREPARED FOR PUBLICATION IN EDUCATION AND PSYCHOLOGICAL JOURNALS WITH BRIEF EXPLANATIONS AS TO HOW THEY ARE RELATED TO THE STATED OBJECTIVES OF PROJECT 2599. IN ADDITION THERE ARE FURTHER ANALYSES WHICH PERTAIN TO THE OBJECTIVES BUT WHICH ARE NOT IN THE FORM OF PUBLISHABLE ARTICLES AND ANALYSES WHICH ARE NOT CALLED FOR IN THE ORIGINAL OBJECTIVES BUT WHICH THE EXPERIMENTERS THOUGHT INTERESTING.

CHAPTER II

CAN TEACHING GRAMMATICAL CONSTRAINTS IMPROVE READING SKILL?

The first attempt to improve reading skill involved using the cloze technique as an instructional device. The results of this experiment are contained in an article entitled A Failure to Improve Reading Comprehension with Cloze Procedure. This article will be submitted to the Journal of Developmental Reading in approximately the following form:

In 1962, Bloomer (2) reported a study in which he used Taylor's (13) cloze procedure to produce a significant increase in the level of reading comprehension of college students, as measured by forms A and B of the Diagnostic Reading Survey Test. The 40 subjects in his Experimental Group filled in from 500 to 2500 cloze test blanks and after each 50 blanks were informed as to whether the words which they had filled in were correct (the exact word which had been deleted) or acceptable (made sense in the context). Bloomer concluded that the cloze procedure improved reading comprehension because it forced attention to detail and awareness of the main ideas in the paragraphs, and required inferences based on the material.

Strictly speaking, the following experiment is not a replication since it was designed to collect information about passages as well as information about reading comprehension. However, since it closely resembles Bloomer's study, a comparison may suggest limitations and necessary procedures when using the cloze procedure to improve reading.

Cloze tests were formed from 36 passages of 150 words each by deleting every fifth word. These passages ranged in difficulty from first grade level to extremely difficult adult prose. The passages were arranged into

six booklets. Each booklet contained six passages covering the whole range of difficulty.

At the beginning of the experiment, the 20 subjects in the Experimental Group and the 20 subjects in the Control Group were given either Form A or Form B of the Davis Reading Test. Half of the subjects in each group received Form A and the other half received Form B. Each subject in the Experimental Group then filled in all 36 cloze tests -- a total of 1800 responses per subject (which compares favorably with Bloomer's mean number of responses). The order in which the booklets were presented was systematically controlled so that a booklet was presented to some subjects as their first booklet, to others as their second, etc. Most of the subjects filled in their six booklets in six separate sessions, approximately three sessions per week. A few filled in two booklets per session and completed the entire program in less than a week. After filling in two booklets, the subjects were given a lecture explaining how to use syntactic clues to improve their scores. The subjects were motivated by offering a prize of $1.00 for the best score in each session and $5.00 for the best score in all six sessions. Finally, both groups were retested on the Davis Reading Test. Those subjects who had received Form A at the beginning of the experiment were now given Form B and vice versa.

Results

The Experimental subjects did not improve in their ability to fill in cloze tests. Mean correct insertions (of a possible 180) for the first through the sixth booklets were: 96.7, 97.4, 99.0, 101.5, 96.7, 98.4.

A comparison of the test-retest scores on the Comprehension scale of the Davis showed an insignificant increase in the level of comprehension

FOR THE CONTROL GROUP AND AN INSIGNIFICANT DECREASE FOR THE EXPERIMENTAL GROUP. ALTHOUGH IT SEEMS TO BE NOTHING BUT RANDOM ERROR, THESE RESULTS ARE IN THE OPPOSITE DIRECTION FROM BLOOMER'S.

DISCUSSION

SINCE NO IMPROVEMENT OCCURRED IN THE PRESENT STUDY AFTER OUR SUBJECTS HAD FILLED IN 1800 CLOZE RESPONSES, THE POSSIBILITY MUST BE CONSIDERED THAT BLOOMER'S RESULTS REPRESENT AN ORDINARY TYPE I ERROR AND ARE NOT REPLICABLE. BEFORE ACCEPTING SUCH A CONCLUSION, HOWEVER, SEVERAL IMPORTANT DIFFERENCES BETWEEN THE PRESENT STUDY AND BLOOMER'S SHOULD BE NOTED.

THE TWO STUDIES USED DIFFERENT TESTS OF "READING COMPREHENSION". IT IS QUITE POSSIBLE THAT THESE TESTS DO NOT MEASURE THE SAME THING OR THAT ONE IS MORE SENSITIVE THAN THE OTHER. IN THIS REGARD, IT IS IMPORTANT TO NOTE THAT ALTHOUGH BLOOMER'S SUBJECTS IMPROVED THEIR COMPREHENSION SCORES ON THE DIAGNOSTIC READING SURVEY TEST (628 TO 868), THEY GREATLY REDUCED THEIR READING RATE (859 TO 696). COULD ONE GET A SIMILAR IMPROVEMENT IN COMPREHENSION WITHOUT A COURSE IN READING IMPROVEMENT BY TELLING THE SUBJECTS TO READ MORE SLOWLY?

THE MOST APPEALING EXPLANATION OF THE CONFLICTING RESULTS IS TO NOTE THAT BLOOMER'S PROCEDURE WAS A LITTLE BETTER DESIGNED TO PRODUCE LEARNING THAN OUR OWN. (WE WERE INTERESTED IN EVALUATING THE PASSAGES AND THIS NECESSITATED SACRIFICING A FEW PRACTICES OF EFFECTIVE INSTRUCTION.) THE MAIN POINTS IN WHICH BLOOMER'S INSTRUCTIONAL PROCEDURES WERE SUPERIOR TO OURS WERE:

1. BLOOMER USED SUBJECTS WHO WERE HIGHLY MOTIVATED TO IMPROVE THEIR READING COMPREHENSION. THEY WERE STUDENTS WHO HAD VOLUNTEERED FOR A

NON-CREDIT READING IMPROVEMENT COURSE.

2. BLOOMER MOTIVATED HIS SUBJECTS BY PROVIDING KNOWLEDGE OF RESULTS FOR EACH RESPONSE. AFTER FINISHING A CLOZE TEST WHICH REQUIRED THEM TO INSERT ONLY 50 WORDS, BLOOMER'S SUBJECTS CHECKED THEIR ANSWERS WITH A KEY.

3. BLOOMER PRESENTED HIS CLOZE TESTS IN A MANNER THAT GRADUALLY INCREASED THE LEVEL OF DIFFICULTY. HIS SUBJECTS BEGAN WITH A CLOZE TEST FOR FIRST GRADE PROSE AND HAD TO REACH A CRITERION OF 96% CORRECT RESPONSES BEFORE THEY RECEIVED MORE ADVANCED MATERIAL. PROBABLY THE MOST IMPORTANT POINT IS THAT HIS SUBJECTS WERE PRESSURED TO REACH A NEAR PERFECT CLOZE SCORE BEFORE BEING REINFORCED BY RECEIVING MORE ADVANCED MATERIAL. IN SHORT, BLOOMER WAS FOLLOWING THE PRIMARY RULE OF OPERANT LEARNING -- HE ARRANGED HIS PROCEDURE SO THAT HE COULD REINFORCE HIS LEARNER AS SOON AS THE DESIRED BEHAVIOR WAS PERFORMED.

IF TEACHING GRAMMATICAL CONSTRAINTS COULD PRODUCE IMPROVEMENT IN READING SKILL, THE FAILURE OF THE CLOZE TECHNIQUE TO PRODUCE A MEASUREABLE IMPROVEMENT COULD HAVE BEEN DUE TO EITHER OF TWO FACTORS. EITHER THE CLOZE PROCEDURE IS NOT A SATISFACTORY METHOD OF TEACHING THESE CONSTRAINTS OR THE READING TEST USED WAS NOT SENSITIVE ENOUGH TO SHOW ANY IMPROVEMENT. THE NEXT EXPERIMENT USED A DIFFERENT METHOD OF TEACHING GRAMMATICAL CONSTRAINTS AND A READING COMPREHENSION TEST DESIGNED BY THE EXPERIMENTERS. THE RESULTS OF THIS EXPERIMENT ARE CONTAINED IN AN ARTICLE ENTITLED IMPROVING READING SKILLS BY TEACHING GRAMMATICAL CONSTRAINTS. THIS ARTICLE HAS BEEN SUBMITTED TO THE JOURNAL OF EDUCATIONAL RESEARCH IN APPROXIMATELY THE FOLLOWING FORM:

SEVERAL STUDIES (1, 8, 9) HAVE DEMONSTRATED THAT CLOZE TESTS (13) ARE

USEFUL IN INVESTIGATING THE DIFFICULTY OF INDIVIDUAL WORDS, WORD CLASSES, AND COMPLEX GRAMMATICAL CONSTRUCTIONS. AN ANALYSIS OF OVER 20,000 RESPONSES TO CLOZE TESTS (3) REVEALED THAT THE WORD CATEGORY WHICH PRODUCED THE HIGHEST PROPORTION OF INCORRECT RESPONSES (79 PERCENT) WAS THE NOMINALIZATION. NOMINALIZATIONS BEING ABSTRACT NOUNS FORMED FROM VERBS (E.G., DEMONSTRATION FROM DEMONSTRATE). ANOTHER RECENT STUDY (6) SHOWED THAT NOT ONLY NOMINALIZATIONS BUT ALSO THE PASSIVE VOICE CONSTRUCTIONS WHICH OFTEN ACCOMPANY THEM MAKE READING MATERIAL HARDER TO COMPREHEND AND LEARN.

THE PURPOSE OF THE PRESENT EXPERIMENT WAS TO DETERMINE WHETHER STUDENTS GIVEN A TWO-DAY COURSE IN THE TRANSFORMATIONAL GRAMMAR RULES (7) RELATING TO NOMINALIZATION AND PASSIVE VOICE WOULD IMPROVE THEIR READING COMPREHENSION.

MATERIALS

FORM A AND FORM B OF THE DAVIS READING TEST (DRT), COPYRIGHT 1958, 1962 BY THE PSYCHOLOGICAL CORPORATION, WERE USED AS A PART OF THE EVALUATION OF THE EFFECTIVENESS OF THE COURSE.

ANOTHER READING COMPREHENSION TEST (M-B) WAS DEVELOPED BY THE AUTHORS TO EVALUATE THE READING COURSE. THIS TEST CONSISTED OF 20 PAIRS OF SENTENCES. THE INSTRUCTIONS WERE TO INDICATE WHETHER THE TWO SENTENCES HAD THE SAME OR DIFFERENT MEANING. MOST OF THE PAIRS OF SENTENCES INCLUDED ONE SENTENCE WHICH CONTAINED A NOMINALIZATION AND ONE SENTENCE WHICH WAS A CORRECT OR INCORRECT DE-TRANSFORMATION OF THE NOMINALIZATION. AN EXAMPLE FROM THE TEST WHICH INVOLVES AN INCORRECT DE-TRANSFORMATION IS AS FOLLOWS:

1. EXAMINATION OF A SINGLE INDIVIDUAL'S REACTION TO A SINGLE ALLEY LEADS

TO THE EXPECTATION OF HIS EXPLORING THE ALLEY TO ITS END ON THE FIRST TRIAL PERHAPS.

2. WHEN A SINGLE INDIVIDUAL EXAMINES HIS REACTIONS TO A SINGLE ALLEY, HE PERHAPS EXPECTS TO EXPLORE THE ALLEY TO ITS END ON THE FIRST TRIAL.

THE COMPLETE TEST IS IN APPENDIX A.

THE MATERIALS USED IN THE READING COURSE WERE A SHORT COURSE IN TRANSFORMATIONAL GRAMMAR DESIGNED BY THE AUTHORS AND A PRACTICE EXERCISE SIMILAR TO THE M-B TEST. THE COURSE WAS IN THREE SECTIONS. THE FIRST SECTION INTRODUCED THE IDEA THAT ONE COULD DERIVE ONE SENTENCE OR PHRASE FROM ANOTHER BY A LAWFUL PROCESS CALLED TRANSFORMATION. THE SECOND SECTION EXPLAINED THE ACTIVE-PASSIVE TRANSFORMATION AND PROVIDED THE STUDENTS WITH SOME PRACTICE IN MAKING THIS TRANSFORMATION (E.G., JOHN HIT THE BALL --- THE BALL WAS HIT BY JOHN). THE THIRD SECTION EXPLAINED THE NOMINALIZATION TRANSFORMATION AND GAVE PRACTICE IN MAKING THIS TRANSFORMATION (E.G., JOHN OPERATED THE BOAT --- JOHN'S OPERATION OF THE BOAT).

THE TEXT OF THE COURSE AND THE PRACTICE SENTENCES ARE IN APPENDIX B.

PROCEDURE

AT THE BEGINNING OF THE SEMESTER THE AUTHORS ADMINISTERED THE DRT AND THE M-B TEST TO BOTH THE EXPERIMENTAL GROUP AND THE CONTROL GROUP. ABOUT HALF OF EACH GROUP TOOK FORM A OF THE DRT. THE OTHERS TOOK FORM B.

DURING THE FIFTEENTH WEEK OF THE FIRST SEMESTER OF FRESHMAN ENGLISH AN UNDERGRADUATE ASSISTANT ADMINISTERED THE FOLLOWING TREATMENTS TO THE EXPERIMENTAL GROUP IN PLACE OF THEIR REGULAR CLASSES:

1. THE RESEARCH ASSISTANT TAUGHT THE TRANSFORMATIONAL GRAMMAR COURSE.

2. The students took the practice exercise.

3. The practice exercise was graded in class.

4. The M-B test was readministered.

5. The alternate form of the DRT was administered. Those who had taken Form A at the beginning of the semester now received Form B. Those who had taken Form B now got Form A.

During the fifteenth week of the semester the Control Group retook the M-B test and took the alternate form of the DRT.

Results

Neither group showed any significant improvement on the Comprehension scale of the DRT.

The M-B test involved 20 choices between two alternatives (means the same or does not mean the same). Thus, a student should obtain an average score of 10 purely on the basis of chance. Ten was subtracted from each student's scores on the original and the readministration of the M-B test. Comparing these two resulting scores for each student, the Control Group showed a mean improvement of nine percent upon readministration while the Experimental Group showed a mean improvement of 50 percent upon readministration.

In order to test the significance of the differences between the two groups, each student was assigned a score equal to the total number of correct responses on the readministration of the M-B test minus the total number of correct responses on the first administration of the test. Each student in the Control Group was matched with a student in the Experimental Group on the basis of the first administration of the M-B test. The difference in favor of the Experimental Group over the Control Group was

($p < .05$, df = 64) by a matched pairs t test.

Discussion

There are three questions left unanswered by the statistical analysis of the data:

1. Why did the DRT show no improvement in reading comprehension?
2. Could the greater improveme t on the M-B test by the Experimental Group be due to the fact that the Experimental Group took a practice exercise similar to the M-B test while the Control Group did not?
3. Does the M-B test really measure reading comprehension?

Since the DRT requires the student to read passages and answer questions about the passages, it is necessary not only to understand the passagLs but to also understand the questions. It is the authors' impression that in many instances the questions are more difficult to understand than the passages to which they refer, and that the primary source of this difficulty is the vocabulary used in the questions. Probably one good way to increase reading comprehension is to increase vocabulary but since the reading course used in this study was not designed to do this, it is not surprising that there was no improvement on the DRT.

Since the M-B test and the practice exercise had no content morphemes in common, positive transfer between the two would have been on the basis of common grammatical structures and the research hypothesis was that increased knowledge of grammatical structures would facilitate comprehension.

The validity of the M-B test is probably best approached on grounds of logic. One operational definition of comprehension of a sentence would be the performance of restating the "meaning" of the sentence in different words. The judgement measured by the M-B test requires the student to

FIRST PERFORM SUCH AN OPERATION. IT APPEARS THEM THAT A TWO-DAY COURSE IN TRANSFORMATIONAL GRAMMAR DID RAISE THE READING COMPREHENSION LEVEL OF FRESHMAN ENGLISH STUDENTS.

ABSTRACT

SIXTY-FIVE STUDENTS IN FRESHMAN ENGLISH CLASSES WERE GIVEN A SHORT COURSE IN TRANSFORMATIONAL GRAMMAR TO ACQUAINT THEM WITH THE NOMINALIZATION AND ACTIVE-PASSIVE TRANSFORMATIONS. ON TEST-RETEST SCORES, AS COMPARED WITH A CONTROL GROUP BY A MATCHED-PAIRS t TEST, THE EXPERIMENTAL GROUP SHOWED A SIGNIFICANT ($p < .05$) IMPROVEMENT IN READING COMPREHENSION AS MEASURED BY A TEST DEVELOPED BY THE AUTHORS BUT NO IMPROVEMENT ON THE DAVIS READING TEST. IT WAS CONCLUDED THAT A KNOWLEDGE OF THE GRAMMATICAL CONSTRAINTS IN ENGLISH FACILITATES THE COMPREHENSION OF DIFFICULT PROSE.

CHAPTER III

CAN CLOZE TESTS MEASURE THE EFFICIENCY WITH WHICH WRITTEN MATERIAL CONVEYS NEW INFORMATION AND IS THERE AN OPTIMAL LEVEL OF REDUNDANCY FOR CONVEYING NEW INFORMATION?

The questions asked in the title of this chapter imply that a prose passage contains two types of information for the subject: old and new. By old information we mean information in the passage which the subject can predict without ever having seen the passage -- based on his knowledge of the English language and the associative structure of English. Our operational definition of old information is the percentage of verbatim replacements of the deleted words in cloze tests -- where the subject has no prior knowledge of the passage before he tries to replace the deleted words. Besides giving a measure of the old information in the passage, such cloze tests provide a measure of readability for each passage which is related to the redundancy of the passage and can thus be utilized in answering the questions about an optimal level of redundancy for transmitting new information. Our operational definition of new Information Gained is also based on a variation of the cloze technique. If we subtract the old information from the total information gained after one reading of the passage, the remainder is logically the new information acquired by the subject during his reading of the passage. More specifically, the

$$\text{Present Information Gained} = \frac{\text{Number of correct replacements after reading the passage}}{\text{Number of deletions}} - \frac{\text{Number of correct replacements before reading the passage}}{\text{Number of deletions}}$$

One of the most important functions of these IG scores is their relationship to the readability or redundancy* levels of the passages. Several readability scales were generated for this purpose (and for estimating old

*As used in Garner, W. R. 1962. Uncertainty and Structure as Psychological Concepts. New York, John Wiley and Sons.

information). These scales are described in an article entitled A Scale of Readability for English Prose which will be submitted to the Journal of Verbal Learning and Verbal Behavior in approximately the following form:

Newman and Gerstman (11), Newman and Waugh (12), Carterette and Jones (5), and Jones and Carterette (10) have reported estimates of the redundancy of printed English based on the sum of the distributional constraint of the letters and the simple unilateral contingencies between the letter being predicted and the preceding letters. Since the words were scrambled before the analyses, this method not only ignores the interactions between letters but also ignores constraints between words. In the Jones and Carterette papers it is implied that this estimate of redundancy can be used as a measure of the difficulty of learning or reading the material. If this is a good measure, however, it must be concluded on the basis of these studies that there is very little increase in difficulty beyond the fifth grade level.

It is true (Carson, 4) that most of the sequential constraint in English is intraword constraint but cloze tests show that degrees of difficulty well beyond the fifth grade level can be descriminated. The two purposes of this experiment are to compare the results of three variants of the cloze procedure as measures of reading difficulty or readability, and to establish a basis for a scale of readability for a number of passages of varying difficulty so that the Information Gain scores and various stimulus dimensions of the passages can be correlated with their readability scores.

Method

Materials. Thirty-six passages were chosen from materials which ranged in difficulty from a first grade reader to very difficult technical prose. Some of the passages were slightly altered so that each passage contained

EXACTLY 150 WORDS. FROM THESE PASSAGES THREE DIFFERENT TYPES OF CLOZE TEST WERE CONSTRUCTED: CT I FIVE VERSIONS OF THIS TEST WERE CONSTRUCTED FOR EACH PASSAGE. THE FIRST VERSION WAS FORMED BY DELETING EVERY FIFTH WORD BEGINNING WITH THE FIRST WORD. THE SECOND WAS FORMED BY DELETING EVERY FIFTH WORD BEGINNING WITH THE SECOND WORD, THE THIRD BEGAN WITH THE THIRD WORD, AND SO ON UNTIL EVERY WORD WAS DELETED FROM ONE OF THE FIVE VERSIONS. THUS, WHEN THE TESTS WERE ADMINISTERED TO A GROUP OF SUBJECTS, IT WAS POSSIBLE TO OBTAIN A CLOZE SCORE FOR EACH WORD IN THE PASSAGE. THE AVERAGE OF THESE CLOZE SCORES WAS A MEASURE OF THE COMPLEXITY OR DIFFICULTY OF EACH PASSAGE BASED ON ALL ITS WORDS. EACH VERSION CONTAINED 30 DELETED WORDS AND THE LENGTH OF THE BLANKS WHICH REPLACED THE WORDS WERE ALL THE SAME SO THAT NO CLUE AS TO THE LENGTH OF THE DELETED WORD COULD BE OBTAINED FROM THE LENGTH OF THE BLANK. FOR CONVENIENCE, THE TESTS WERE STAPLED INTO SIX BOOKLETS OF SIX TESTS EACH. EACH BOOKLET CONTAINED BOTH EASY AND DIFFICULT PASSAGES ARRANGED IN AN ORDER THAT ALTERNATED EASY AND DIFFICULT PASSAGES. CT II ORDINARY CLOZE TESTS LIKE CT I DO NOT ALLOW THE SUBJECT TO USE ALL THE CONSTRAINT IN THE ORIGINAL UNDELETED PASSAGES WHEN HE TRIES TO REPLACE ANY PARTICULAR WORD. IT MIGHT BE THAT IN ONE OF THE PASSAGES NEARLY ALL OF THE CONSTRAINT ON THE TENTH WORD IN THE PASSAGE IS FROM THE FIFTH WORD. IF THIS WERE THE CASE IN A CLOZE TEST FORMED AS THOSE IN CT I WERE, THE SUBJECT TRYING TO REPLACE THE TENTH WORD COULD NOT USE THE CONSTRAINT FROM THE FIFTH WORD BECAUSE IT TOO WOULD BE DELETED. IN ORDER TO GIVE THE SUBJECTS A CHANCE TO USE ALL OF THE CONSTRAINT IN A PASSAGE, CT II CONSISTED OF 150 VERSIONS OF EACH PASSAGE, EACH WITH ONLY ONE WORD DELETED. CT II ALSO DIFFERED FROM CT I IN THAT THE DELETED WORD WAS NOT REPLACED BY A BLANK EQUAL IN LENGTH TO ALL OTHER BLANKS BUT WAS MERELY BLACKED OUT BY A MARK

EQUAL IN LENGTH TO THE WORD WHICH WAS DELETED. THIS CONFOUNDS THE TWO ADDED SOURCES OF INFORMATION IN CT II (THE LENGTH OF THE BLANKS AND THE CONSTRAINT FROM THE WORDS DELETED IN CT I BUT NOT DELETED IN CT II) BUT IT WAS IMPRACTICAL TO PRINT 150 VERSIONS OF EACH PASSAGE. CT III WHEREAS CT I AND CT II ALLOW THE SUBJECT TO UTILIZE BILATERAL CONSTRAINT, CT III WAS DESIGNED TO PERMIT THE USE OF ONLY UNILATERAL CONSTRAINT. THE SUBJECTS WERE ALLOWED TO SEE ONLY THOSE WORDS PRECEDING THE WORD THEY WERE TRYING TO REPLACE.

THE PASSAGES WITH THEIR READABILITY AND INFORMATION GAIN SCORES ARE IN APPENDIX C.

ADMINISTRATION.

1. FOR CT I, THE 20 SUBJECTS (FOUR FOR EACH OF THE FIVE VERSIONS OF EACH PASSAGE) WERE ALLOWED SIX MINUTES TO COMPLETE ONE VERSION OF EACH PASSAGE. ALL 36 TESTS WERE COMPLETED IN FROM THREE TO SIX SESSIONS. THE PASSAGES WERE ADMINISTERED IN AN ORDER THAT SYSTEMATICALLY BALANCED ORDER OF PRESENTATION, I.E., EACH PASSAGE WAS AMONG THE FIRST ATTEMPTED BY SOME SUBJECTS AND AMONG THE LAST ATTEMPTED BY OTHERS; IT WAS AMONG THE FIRST PASSAGES IN SOME BOOKLETS AND AMONG THE LAST IN OTHERS. THERE WAS A TOTAL OF 600 RESPONSES TO EACH OF THE 36 PASSAGES IN CT I (30 BLANKS x 5 VERSIONS x 4 SUBJECTS PER VERSION).
2. FOR CT II, THE 450 SUBJECTS (THREE FOR EACH VERSION OF EACH PASSAGE) WERE ALLOWED UNLIMITED TIME. THERE WAS A TOTAL OF 450 RESPONSES TO EACH OF THE 36 PASSAGES IN CT II (1 BLANK PER VERSION x 150 VERSIONS PER PASSAGE x 3 SUBJECTS PER VERSION).
3. FOR CT III, THE NINE SUBJECTS WERE TESTED IN A SINGLE GROUP. THE PASSAGES WERE PUT ON TRANSPARENCIES AND PROJECTED ONTO A SCREEN USING AN OVERHEAD PROJECTOR. EACH LINE OF A PASSAGE WAS COVERED BY A THIN STRIP OF MASKING TAPE. THE EXPERIMENTER PULLED THE MASKING TAPE OFF THE TRANSPARENCY SO THAT A NEW

WORD WAS EXPOSED EVERY SEVEN SECONDS. THE SUBJECTS WERE REQUIRED TO WRITE DOWN THEIR BEST GUESS AS TO WHAT THE NEXT WORD WOULD BE BEFORE IT WAS REVEALED. THE SUBJECTS FOR CT III WERE PAID AND COMPLETED ONE OR TWO PASSAGES PER DAY. THERE WERE 1350 RESPONSES TO EACH OF THE PASSAGES IN CT III (150 RESPONSES PER PASSAGE x 9 SUBJECTS).

RESULTS

A RESPONSE WAS CONSIDERED CORRECT ONLY IF THE EXACT WORD WHICH HAD BEEN DELETED WAS REPLACED. IN ORDER TO MAKE THE RESULTS FROM CT I, CT II, AND CT III COMPARABLE, THE SCORES FOR EACH PASSAGE WERE CHANGED TO PERCENTAGE OF CORRECT RESPONSES. THE TOTAL NUMBER OF CORRECT RESPONSES BY ALL SUBJECTS TO EACH PASSAGE IN EACH TEST WAS DIVIDED BY 600 IN THE CASE OF CT I, 450 IN THE CASE OF CT II, AND 1350 FOR CT III. THE MEAN PERCENTAGE OF CORRECT RESPONSES, AVERAGED ACROSS ALL 36 PASSAGES, FOR CT I, CT II, AND CT III RESPECTIVELY WERE 54.6, 63.8, AND 33.7. THE S.D.'S OF THESE MEANS WERE 14.5, 11.0, AND 7.6.

ALTHOUGH IT IS INTERESTING TO NOTE THAT REDUCING THE PROPORTION OF THE TOTAL CONSTRAINT IN THE PASSAGES WHICH THE SUBJECT IS ALLOWED TO UTILIZE IN REPLACING THE DELETED WORDS (AS IN CT I AND CT III) CHANGES THE OVERALL PERCENTAGE OF CORRECT RESPONSES, THESE DIFFERENCES ARE NOT AS IMPORTANT IN CONSTRUCTING A SCALE OF READABILITY AS THE FACT THAT THE DATA FROM ALL THREE METHODS RANK THE PASSAGES APPROXIMATELY THE SAME AS TO ORDER OF DIFFICULTY.

IF THE PASSAGES ARE RANKED ACCORDING TO THE NUMBER OF CORRECT RESPONSES TO EACH PASSAGE, THE HIGHEST AGREEMENT IN ORDER (RHO = .94) IS BETWEEN CT I AND CT II, BOTH OF WHICH ALLOW THE SUBJECT TO UTILIZE BILATERAL CONSTRAINT. THIS MEANS THAT THE MORE EFFICIENT CT I GIVES ESSENTIALLY THE SAME RESULTS AS THE PRESUMABLY MORE ACCURATE CT II.

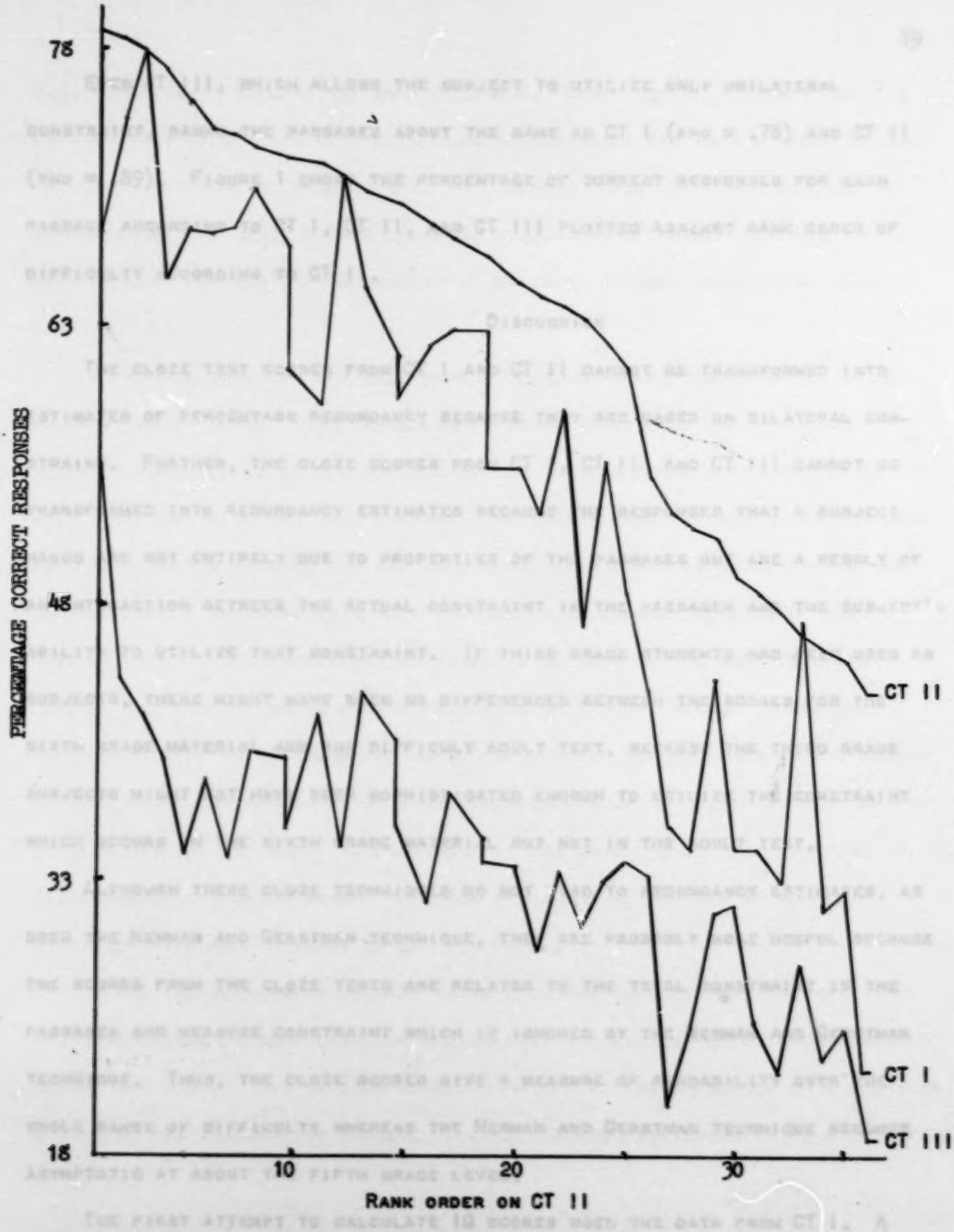

FIGURE 1. PERCENTAGE CORRECT RESPONSES ON CT I, CT II, AND CT III AS A FUNCTION OF RANK ORDER ACCORDING TO CT II.

Even CT III, which allows the subject to utilize only unilateral constraint, ranks the passages about the same as CT I (rho = .78) and CT II (rho = .89). Figure 1 shows the percentage of correct responses for each passage according to CT I, CT II, and CT III plotted against rank order of difficulty according to CT II.

Discussion

The cloze test scores from CT I and CT II cannot be transformed into estimates of percentage redundancy because they are based on bilateral constraint. Further, the cloze scores from CT I, CT II, and CT III cannot be transformed into redundancy estimates because the responses that a subject makes are not entirely due to properties of the passages but are a result of an interaction between the actual constraint in the passages and the subject's ability to utilize that constraint. If third grade students had been used as subjects, there might have been no differences between the scores for the sixth grade material and the difficult adult text, because the third grade subjects might not have been sophisticated enough to utilize the constraint which occurs in the sixth grade material but not in the adult text.

Although these cloze techniques do not lead to redundancy estimates, as does the Newman and Gerstman technique, they are probably more useful because the scores from the cloze tests are related to the total constraint in the passages and measure constraint which is ignored by the Newman and Gerstman technique. Thus, the cloze scores give a measure of readability over the whole range of difficulty whereas the Newman and Gerstman technique becomes asymptotic at about the fifth grade level.

The first attempt to calculate IG scores used the data from CT I. A matched group of 20 subjects were allowed to read the passages and then

WERE REQUIRED TO REPLACE THE DELETED WORDS. SINCE THE 20 SUBJECTS IN CT I WERE ALLOWED TO UTILIZE BILATERAL CONSTRAINT, THERE WAS SUCH A SMALL GAIN BY THE GROUP WHO WERE ALLOWED TO READ THE PASSAGE FIRST THAT THIS MEASURE WAS CONSIDERED A FAILURE. A MORE THOROUGH DISCUSSION OF THIS EXPERIMENT IS AVAILABLE IN COLEMAN'S FINAL REPORT OF NATIONAL SCIENCE FOUNDATION RESEARCH GRANT NSF-GB-2604.

IG SCORES BASED ON THE DATA FROM CT III, HOWEVER, SHOWED GAINS IN NEW INFORMATION OF NEARLY 50%. ALTHOUGH IT IS NOT MENTIONED IN THE ARTICLE, THE NINE SUBJECTS IN CT III DID NOT FOLLOW THE PROCEDURE OUTLINED FOR CT III JUST ONCE BUT TWICE FOR EACH PASSAGE. AFTER THE SUBJECTS HAD TRIED TO GUESS EACH WORD IN THE PASSAGE AND HAD BEEN SHOWN EACH WORD, AS DESCRIBED IN THE ARTICLE (WHICH AMOUNTED TO A VERY THOROUGH WORD-BY-WORD READING OF THE PASSAGE) THEY WERE IMMEDIATELY REQUIRED TO GO THROUGH THE SAME PROCEDURE AGAIN. THE PERCENTAGE IG SCORES PRESENTED WITH EACH PASSAGE IN APPENDIX C WERE CALCULATED BY DIVIDING THE NUMBER OF CORRECT REPLACEMENTS ON THE SECOND ATTEMPT MINUS THE NUMBER OF CORRECT REPLACEMENTS ON THE FIRST ATTEMPT BY THE TOTAL NUMBER OF WORDS IN THE PASSAGE. IF ONE USES THE CT III VARIATION OF THE CLOZE TECHNIQUE, CLOZE SCORES DO YIELD A MEASURE OF THE NEW INFORMATION GAINED BY READING A PASSAGE OF ENGLISH PROSE.

SINCE THE PURPOSE OF READING IS TO GAIN NEW INFORMATION, THE NEXT STEP WAS TO DISCOVER AT WHAT LEVEL OF READABILITY THE PERCENT GAIN IN INFORMATION IS THE GREATEST. THIS IS DONE SIMPLY BY PLOTTING THE IG SCORES AS A FUNCTION OF ONE OF THE READABILITY SCALES. FIGURE 2 SHOWS PERCENTAGE IG AS A FUNCTION OF CT II.

EXAMINATION OF FIGURE 2 REVEALS THAT THE PASSAGES WHICH ARE FROM 70 TO 75 PERCENT PREDICTABLE, ON THE BASIS OF BILATERAL CONSTRAINT, YIELD THE MAXIMUM GAIN IN IG. SEVENTY TO SEVENTY-FIVE PERCENT PREDICTABILITY IS CONSIDERABLY LESS THAN THE NINETY-FIVE PERCENT PREDICTABILITY AIMED AT BY MOST PROGRAMMED INSTRUCTION BUT IS STILL REMARKABLY LOW LEVEL PROSE TO BE MAXIMALLY INFORMATIVE TO COLLEGE FRESHMEN. THE PASSAGES AT THIS LEVEL ARE RATED BY MC-CALL - CRABBS AS SUITABLE FOR SECOND THROUGH SIXTH GRADES.

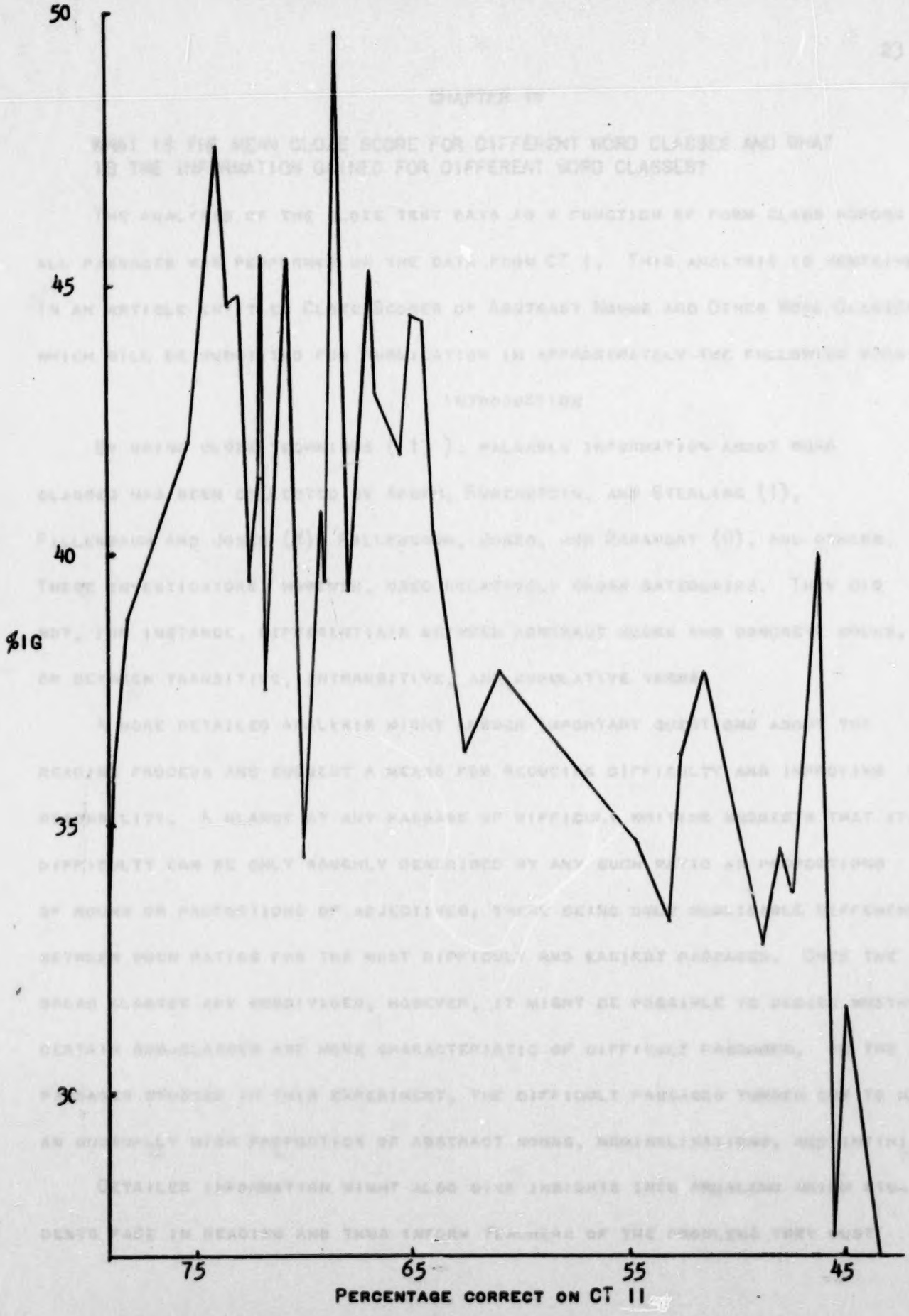

FIGURE 2. PERCENTAGE INFORMATION GAINED AS A FUNCTION OF PERCENTAGE OF CORRECT RESPONSES ON CT II.

CHAPTER IV

WHAT IS THE MEAN CLOZE SCORE FOR DIFFERENT WORD CLASSES AND WHAT IS THE INFORMATION GAINED FOR DIFFERENT WORD CLASSES?

THE ANALYSIS OF THE CLOZE TEST DATA AS A FUNCTION OF FORM CLASS ACROSS ALL PASSAGES WAS PERFORMED ON THE DATA FROM CT I. THIS ANALYSIS IS CONTAINED IN AN ARTICLE ENTITLED CLOZE SCORES OF ABSTRACT NOUNS AND OTHER WORD CLASSES WHICH WILL BE SUBMITTED FOR PUBLICATION IN APPROXIMATELY THE FOLLOWING FORM:

INTRODUCTION

BY USING CLOZE TECHNIQUE (13), VALUABLE INFORMATION ABOUT WORD CLASSES HAS BEEN COLLECTED BY ABORN, RUBENSTEIN, AND STERLING (1), FILLENBAUM AND JONES (8), FILLENBAUM, JONES, AND RAPAPORT (9), AND OTHERS. THESE INVESTIGATORS, HOWEVER, USED RELATIVELY GROSS CATEGORIES. THEY DID NOT, FOR INSTANCE, DIFFERENTIATE BETWEEN ABSTRACT NOUNS AND CONCRETE NOUNS, OR BETWEEN TRANSITIVE, INTRANSITIVE, AND COPULATIVE VERBS.

A MORE DETAILED ANALYSIS MIGHT ANSWER IMPORTANT QUESTIONS ABOUT THE READING PROCESS AND SUGGEST A MEANS FOR REDUCING DIFFICULTY AND IMPROVING READABILITY. A GLANCE AT ANY PASSAGE OF DIFFICULT WRITING SUGGESTS THAT ITS DIFFICULTY CAN BE ONLY ROUGHLY DESCRIBED BY ANY SUCH RATIO AS PROPORTIONS OF NOUNS OR PROPORTIONS OF ADJECTIVES, THERE BEING ONLY NEGLIGIBLE DIFFERENCES BETWEEN SUCH RATIOS FOR THE MOST DIFFICULT AND EASIEST PASSAGES. ONCE THE BROAD CLASSES ARE SUBDIVIDED, HOWEVER, IT MIGHT BE POSSIBLE TO DECIDE WHETHER CERTAIN SUB-CLASSES ARE MORE CHARACTERISTIC OF DIFFICULT PASSAGES. IN THE PASSAGES STUDIED IN THIS EXPERIMENT, THE DIFFICULT PASSAGES TURNED OUT TO HAVE AN UNUSUALLY HIGH PROPORTION OF ABSTRACT NOUNS, NOMINALIZATIONS, AND INFINITIVES.

DETAILED INFORMATION MIGHT ALSO GIVE INSIGHTS INTO PROBLEMS WHICH STUDENTS FACE IN READING AND THUS INFORM TEACHERS OF THE PROBLEMS THEY MUST

concentrate upon when teaching language skills. If a teacher knows which word classes and grammatical constructions give students the most difficulty, he might, by concentrating upon those classes and constructions, be able to teach students to read with greater comprehension.

The primary purpose of this paper is to begin a more detailed analysis of English word classes. One of the main distinctions it strives to make is that between abstract and concrete nouns. Also, four different kinds of verbs are distinguished, all defined as in traditional grammar: transitive verbs, intransitive berbs, copulative verbs, and infinitives.

Method

1. Materials

Cloze scores for 5,400 words were available (Chapter 2). This chapter should be consulted for details of administration, but in brief the 5,400 words represented thirty-six 150-word passages which ranged in difficulty from first-grade material to technical adult prose. Five cloze tests had been made for each passage: the first cloze test formed by deleting the first word and every fifth word thereafter, the next by deleting the second word and every fifth word thereafter, etc. Thus each cloze test contained 30 deleted words, and each of the 5,400 words (36 x 150) was deleted in one version. Four Ss filled in each version so that each of the 5,400 words had a cloze score based on four responses.

2. Classification

The classification is given in Table 1 with examples. Most of it is based on traditional grammar and requires no discussion.

Nouns, though, were analyzed into 11 sub-classes which are described and

discussed. The most important sub-classification simply divided them into concrete and abstract nouns. Concrete nouns were defined as nouns that signify a person, place, or thing -- as indicating matter that can be sensed, or that could be sensed given proper instruments -- e.g., man, Joe, atom, galaxy. Agentives (farmer, driver) and proper nouns were included as concrete nouns.

Abstract nouns are best defined by describing the sub-classes. Admittedly, the sub-classes overlap, but the overlapping is immaterial in distinguishing abstract nouns from concrete nouns -- in distinguishing whether the noun signifies matter that can be sensed.

A. Verb-nominal -- nouns formed by nominalizing a verb, e.g., knowledge, explanation, operation, decision.

B. Adjective-nominal -- nouns formed by nominalizing an adjective, e.g., happiness, beauty, prettiness, pettiness, capability.

C. Process and characteristics -- nouns that are similar to nouns nominalized from verbs and adjectives in that they signify a process or characteristic of something, or name methods, processes, and motions -- e.g., process, duty, job, game, storm, wind, characteristic, quality, symptom.

D. Units -- e.g., feet, yard, gallon, hour, day, summer.

E. Nouns of language -- nouns of metalanguages such as those used to describe language, logic, mathematics, e.g., word, sentence, question, sign, symbol, story, sub-heading, truth, fact, space, time, wave, digit, point, number, also all fields of knowledge, such as history.

F. Animal behavior -- nouns that signify the behavior of animals, e.g., thought, idea, notion, sound, smell, odor, mind, memory.

G. Fractions - nouns that signify a part of something, e.g., top, part, tip, back, region, edge.

H. GROUPS -- NOUNS THAT GROUP OTHER NOUNS, E.G., FLOCK, GROUP, LOAD, SET. IN ADDITION, ALL OTHER NOUNS NAMING CHARACTERISTICS OF THINGS, CHARACTERISTICS OF ABSTRACTIONS, PARTS OF ABSTRACTIONS, NAMES OF EVENTS (HOLIDAYS), AND CONCEPTS WERE CLASSIFIED AS ABSTRACT NOUNS.

TWO Es USED THIS SYSTEM TO CLASSIFY NOUNS IN A PASSAGE 1500 WORDS LONG CONTAINING 138 CONCRETE NOUNS AND 216 ABSTRACT NOUNS. ALTHOUGH THEY DISAGREED ON ASSIGNING 13 ABSTRACT NOUNS TO SPECIFIC SUB-CLASSES, THEY AGREED ALMOST PERFECTLY IN THEIR DICHOTOMY INTO CONCRETE AND ABSTRACT NOUNS. BOTH Es WERE HESITANT ABOUT THE ASSIGNMENT OF FOUR WORDS, AMBIGUOUS WORDS THAT COULD BE CALLED ABSTRACT OR CONCRETE DEPENDING UPON INTERPRETATION OF THE SENTENCES IN WHICH THEY APPEARED. FOR INSTANCE, ONE E CONSIDERED PUBLICATION TO BE A NOMINALIZATION AND THUS ABSTRACT; THE OTHER CONSIDERED IT TO SIGNIFY THE CONCRETE DOCUMENT ITSELF. THEY ALSO DIFFERED OVER LIGHT. ONE APPEALED TO THE CORPUSCULAR THEORY WHEN HE CLASSIFIED IT AS CONCRETE; THE OTHER THOUGHT THE WAVE THEORY MORE APPROPRIATE FOR THE PARTICULAR CONTEXT AND CONSIDERED LIGHT TO BE ABSTRACT. THEIR RELATIVE LACK OF DISAGREEMENT DOES NOT IMPLY, OF COURSE, THAT TWO INVESTIGATORS WORKING INDEPENDENTLY WILL DEVELOP IDENTICAL DEFINITIONS OF ABSTRACT NOUNS, BUT IT DOES IMPLY THAT LINGUISTICALLY SOPHISTICATED INVESTIGATORS CAN QUICKLY TRAIN THEMSELVES TO AGREE ON DEFINITIONS OF ABSTRACTNESS AND APPLY THEIR DEFINITIONS RELIABLY ENOUGH FOR EXPERIMENTAL INVESTIGATIONS OF THE VARIABLE. RESULTS OF THIS PAPER SUGGEST THAT SINCE THE EFFECTS OF ABSTRACT NOUNS ARE SO GREAT AS TO OVERCOME UNRELIABILITY RESULTING FROM CLASSIFICATION PROBLEMS, IT IS WASTEFUL NOT TO INVESTIGATE THE DIMENSION.

CLASSIFICATION OF VERBS CONSISTED SIMPLY OF PLACING THEM IN ONE OF THE FOUR TRADITIONAL CATEGORIES OF TRANSITIVE VERBS, INTRANSITIVE VERBS, COPULATIVES,

AND INFINITIVES.

3. Scoring

EACH OF THE 5400 WORDS WAS SCORED IN THREE WAYS. IF THE EXACT WORD WAS INSERTED, IT WAS SCORED AS A VERBATIM RESPONSE. EACH WORD WAS ALSO SCORED FOR NUMBER OF VERBATIM RESPONSES PLUS NUMBER OF ACCEPTABLE SYNONYMS. EACH WAS SCORED ADDITIONALLY FOR NUMBER OF CORRECT WORD CLASS INSERTIONS. WHEN COUNTING CORRECT WORD CLASSES, Es USED ONLY THE TRADITIONAL GROSS CLASSES: NOUNS, VERBS, ADJECTIVES, ADVERBS, CONJUNCTIONS, PRONOUNS, PREPOSITIONS, AND INTERJECTIONS.

Results

THE THREE CLOZE SCORES ARE GIVEN FOR 21 WORD CLASSES IN TABLE 1. AFTER REGROUPING INTO GROSSER CATEGORIES, THE SCORES RESEMBLE THOSE OF EARLIER STUDIES, THOUGH THEY ARE SLIGHTLY HIGHER.

ALTHOUGH THERE ARE GREAT DIFFERENCES BETWEEN VERBATIM SCORES FOR THE WORD CLASSES, THOSE DIFFERENCES BECOME MUCH SMALLER WHEN SYNONYMS ARE COUNTED. THE DIFFERENCES PRACTICALLY DISAPPEAR WHEN ALL CORRECT WORD CLASS INSERTIONS ARE COUNTED.

THE VERBATIM SCORES FROM TABLE 1 SUGGEST THAT ABSTRACT NOUNS ARE CLOSELY RELATED TO DIFFICULTY IN READING. THE FOUR MOST FREQUENTLY OCCURRING ABSTRACT NOUN CLASSES (VERB-NOMINAL, NOUN LANGUAGE, ADJECTIVE-NOMINAL, AND NOUN PROCESS) HAVE COMPARATIVELY LOW VERBATIM SCORES.

IT IS IMPORTANT TO NOTE, HOWEVER, THAT DIFFICULTY CANNOT BE EXPLAINED SOLELY ON THE BASIS OF INABILITY TO PERCEIVE ABSTRACT NOUNS THROUGH THE SENSES, SINCE SEVERAL OF THE INFREQUENTLY OCCURRING ABSTRACT NOUN CLASSES HAVE HIGH VERBATIM SCORES. SOME OF THE DIFFICULTY, AT LEAST, MUST RESULT FROM

TABLE I

Form Class	Example	No. of Words	Verbatim	Syn + Verbatim	Correct Word Class
Concrete Nouns					
Common nouns	atom	566	49%	69%	97%
Proper nouns	Mars	108	42%	63%	86%
Abstract Nouns					
Verb-nominal	motion	125	21%	36%	90%
Adj.-nominal	width	65	28%	38%	89%
Process	task	62	32%	58%	99%
Units	mile	97	66%	76%	95%
Language	space	128	27%	42%	84%
Behavior	image	9	55%	78%	100%
Fraction	top	33	43%	65%	94%
Group	covey	40	48%	76%	91%
Verbs					
Copulas	is	117	76%	86%	94%
Transitive	slap	363	42%	68%	92%
Intransitive	swim	176	49%	69%	87%
Infinitives	to go	92	49%	71%	99%
Adjectives	blue	361	26%	47%	94%
Adverb	sadly	68	28%	52%	76%
Function words					
Articles	these	568	74%	91%	95%
Modals	may	206	75%	88%	97%
Conjunctions	and	389	61%	69%	74%
Prepositions	for	595	67%	77%	88%
Pronouns	he	326	72%	88%	92%

reasons other than that abstract nouns cannot be perceived by the senses.

The relation between readability and abstract nouns is best examined by correlation. The verbatim cloze score of each passage can be considered as a measure of its readability. An abstract noun ratio was determined for each passage by dividing its number of abstract nouns by total nouns. The most readable passage had a ratio of .276; the least readable one had a ratio of .710. The r between the measure of readability and abstract noun ratio was - .72. Readable passages contain few abstract nouns.

The total number of transitive plus intransitive verbs was determined for each passage, and this total also was correlated with verbatim cloze scores. The r between the measure of readability and number of transitive plus intransitive verbs was .62. Readable passages contain many transitive and intransitive verbs.

Discussion

The rs show that readable passages include a small number of abstract nouns and a large number of transitive and intransitive verbs. Both author and reader can profit from this information. An author can reduce the proportion of abstract nouns and simultaneously increase the number of transitive and intransitive verbs if he will transform nominalizations to active verbs and adjectives, e.g., Their inclusion of this provision proves its importance to them ⟶ Since they included this provision, it proves it is important to them. Readers might be taught to interpret grammatical transformations that include nominalizations. It would not be overly difficult to teach students to master these nominalizing transformations.

Each of the three cloze scores provides information about a different

KIND OF KNOWLEDGE. THE VERBATIM SCORE IS A MEASURE OF S'S FAMILIARITY WITH SPECIAL CO-OCCURRENCE PATTERNS IN ENGLISH ALONG WITH PERHAPS A SPECIAL KNOWLEDGE OF CERTAIN SUBJECTS COVERED IN THE PASSAGES. IN SOME INSTANCES, THAT IS, THE CO-OCCURRENCE PATTERNS MIGHT REPRESENT GENERAL CLICHES OF THE LANGUAGE OR IDIOMS; IN OTHERS, THEY MIGHT REPRESENT A SPECIAL KNOWLEDGE OF THE LANGUAGE, PATTERNS OF A CRAFT, A PROFESSION, A SOCIETY, I.E. JARGON, SHOP TALK, SLANG. IN SOME WAYS THESE SPECIFIC CO-OCCURRENCE PATTERNS MIGHT EVEN BE CONSIDERED AN INDEX TO S'S KNOWLEDGE OF THE WORLD IN GENERAL. THE VERBATIM + SYNONYM SCORE REFLECTS ALL THE ABOVE KINDS OF KNOWLEDGE PLUS S'S VOCABULARY. THE WORD CLASS SCORE SHOULD REFLECT PRIMARILY HIS KNOWLEDGE OF GRAMMAR.

SUPPOSE, FOR EXAMPLE, THAT A PARTICULAR NOUN SUB-CLASSIFICATION HAS A RELATIVELY HIGH VERBATIM SCORE AND A RELATIVELY LOW WORD CLASS SCORE (E.G., UNIT). THIS WOULD SUGGEST THAT THESE INSERTIONS OWED MORE TO S'S KNOWLEDGE OF THE WORLD AND ENGLISH CO-OCCURRENCE PATTERNS THAN TO HIS KNOWLEDGE OF GRAMMAR. SIMILARLY, SUPPOSE A RELATIVELY LOW VERBATIM SCORE AND A HIGH WORD CLASS SCORE, AS WITH THE PROPER NOUN POSSESSIVE CATEGORY. HERE, S OBVIOUSLY RECOGNIZED THE NEEDED WORD CLASS, BUT WITHOUT A CLUE FROM THE TEXT HE HAD LITTLE KNOWLEDGE OF THIS SPECIFIC CO-OCCURRENCE PATTERN.

AS IN EARLIER EXPERIMENTS, THE WORDS MOST DIFFICULT TO FILL IN CORRECTLY VERBATIM WERE THOSE FOR WHICH S HAD THE GREATEST NUMBER OF CHOICES, THAT IS, NOUNS, ADJECTIVES, ADVERBS, AND VERBS.

EVEN WHEN SYNONYMS WERE ADDED TO VERBATIM INSERTIONS, THE CLOZE SCORES FOR THESE FOUR WORD CLASSES REMAINED SMALLER THAN FOR OTHERS. THE MARGINS OF DIFFERENCE, HOWEVER, HAD BEEN REDUCED BECAUSE THESE FOUR CLASSES CONTAIN SO

MANY DIFFERENT WORDS THAT AN APPRECIABLE NUMBER OF ADDITIONAL ITEMS COULD BE PROVIDED AS SYNONYMS. WITH THE OTHER WORD CLASSES -- CLASSES OF FUNCTION WORDS THAT CONTAIN FEW WORDS -- THERE WAS NOT MUCH OPPORTUNITY FOR S TO FIND SYNONYMS. EITHER HE KNEW THE EXACT WORD AND INSERTED IT, OR HE DID NOT KNOW IT.

WHEN CORRECT WORD CLASS INSERTIONS WERE COUNTED, THERE WERE NO STARTLING DIFFERENCES BETWEEN ANY OF THE CLASSES. IT SHOULD BE RECALLED THAT WHEN SCORING CORRECT WORD CLASSES, ONLY THE TRADITIONAL GROSS CATEGORIES OF THE CLASSES WERE USED. IF THE WORD CLASS INSERTIONS ACTUALLY PROVIDE A MEASURE OF S'S KNOWLEDGE OF TRADITIONAL GRAMMAR, THE RESULTS SUGGEST THAT COLLEGE FRESHMEN HAVE LEARNED TO USE THE GROSS WORD CLASSES IN THE GRAMMATICAL CONSTRUCTIONS OF THEIR LANGUAGE AND THAT THEY KNOW AN APPROXIMATELY EQUAL AMOUNT ABOUT ALL THESE GROSS CLASSES. AS A MATTER OF FACT, SO HIGH WAS THE PERCENTAGE OF CORRECT INSERTIONS FOR ALL THE TRADITIONAL WORD CLASSES THAT IT SEEMS PROBABLY THAT AN ENGLISH INSTRUCTOR COULD IMPROVE READING COMPREHENSION ONLY SLIGHTLY BY GIVING ADDITIONAL TRAINING IN RECOGNIZING GROSSLY CATEGORIZED CLASSES.

THE RESULTS OF THIS EXPERIMENT HELP EXPLAIN WHY EFFECTIVE INSTRUCTION IN IMPROVING READING COMPREHENSION IS SO DIFFICULT TO ACHIEVE. CLEARLY, THE STUDENT'S READING COMPREHENSION CAN BE IMPROVED TO SOME EXTENT BY THE TRADITIONAL METHODS OF MOST ENGLISH COURSES -- ADDITIONAL DRILL IN CONVENTIONAL GRAMMAR, INTRODUCTION TO A WIDER KNOWLEDGE OF THE WORLD THROUGH READING, AND OTHER EXERCISES TO INCREASE VOCABULARY -- BUT THOSE METHODS SEEM TO HAVE APPROACHED THE LIMITS OF THEIR EFFECTIVENESS BECAUSE OF THE GREAT EXPENDITURE OF TIME IN RETURN FOR THE AMOUNT OF ADDITIONAL EFFICIENCY ACQUIRED. IN GRAMMAR, FOR INSTANCE, THERE IS JUST NOT ENOUGH THAT THE STUDENT DOES NOT ALREADY KNOW TO

JUSTIFY THE TIME AND ENERGY REQUIRED TO LEARN MORE; WHILE THERE IS TOO MUCH THAT MUST BE TAUGHT TO INCREASE THE STUDENT'S KNOWLEDGE OF HIS WORLD.

ON THE OTHER HAND, THE EXPERIMENT DOES SUGGEST PRACTICAL AND PRACTICABLE ALTERNATIVES FOR THE ENGLISH INSTRUCTOR. THERE IS THE DISTINCT POSSIBILITY THAT TRAINING THE STUDENT TO UNDERSTAND GRAMMATICAL CATEGORIES THAT USE MORE FINELY CATEGORIZED WORD CLASSES WOULD IMPROVE READING COMPREHENSION. THE PRESENT RESULTS SUGGEST THAT GRAMMATICAL TRANSFORMATIONS USING VERB-NOMINALS AND ADJECTIVE-NOMINALS CAUSE DIFFICULTY FOR THE STUDENT. IT SHOULD BE SIMPLE ENOUGH TO TEACH STUDENTS TO USE THESE TRANSFORMATIONS, ALONG WITH ANY OTHERS THAT DETAILED ANALYSIS MIGHT REVEAL AS PARTICULARLY IMPORTANT IN READING COMPREHENSION. SUCH AN APPROACH, TEACHING THE STUDENT TO GRASP A FEW GRAMMATICAL TRANSFORMATIONS SPECIFICALLY SELECTED BECAUSE THEY CAUSE HIM DIFFICULTY, OFFERS MUCH GREATER HOPE FOR ACHIEVING AN ECONOMICAL WAY OF EFFECTING APPRECIABLE IMPROVEMENT IN READING COMPREHENSION THAN THE TRADITIONAL METHODS NOW MOST WIDELY IN USE.

SUMMARY

COLLEGE FRESHMEN FILLED IN A SERIES OF CLOZE TESTS COVERING 36 PASSAGES OF 150 WORDS EACH GRADED FOR READABILITY. PRESENTATION ASSURED SYSTEMATIC DELETION OF EACH WORD BY 4 Ss. SCORES WERE RECORDED FOR VERBATIM, VERBATIM + SYNONYMS, AND WORD CLASS INSERTIONS. WORD CLASS SCORES SHOWED THAT Ss HAD A GOOD PRACTICAL KNOWLEDGE OF GRAMMAR. FINER ANALYSIS OF WORD CLASS INSERTIONS THAN IN EARLIER EXPERIMENTS SHOWED GENERAL AGREEMENT WITH THE EARLIER EXPERIMENTS AND SHOWED IN ADDITION A RELATIONSHIP BETWEEN CERTAIN WORD CLASSES AND PASSAGE READABILITY. LESS READABLE PASSAGES HAD A HIGHER PROPORTION OF ABSTRACT NOUNS AND A LOWER PROPORTION OF TRANSITIVE AND INTRANSITIVE VERBS THAN READABLE PASSAGES.

Using the same form class categories as presented in Table 1 another analysis was performed to show percentage Information Gained as a function of form class. These IG scores were obtained by essentially the same method (and on the same data) as described in Chapter III except that in this instance the scores were averaged across passages within form classes rather than across form classes within passages. The results of this analysis are presented in Table 2.

One further analysis (not required by the contract) was performed on the data from CT 1. The purpose of this analysis was to discover which formal aspects of the passages (number of nouns, number of verbs, length of sentences, etc.) correlated most highly with the readability scores for the passages. In other words, we were trying to find some formal aspects of the passages which could be used to predict what the cloze score for the passages would be before the cloze test was administered.

For the purposes of this analysis a mean weighted cloze score was computed for each passage from the CT 1 data. If a subject can replace a deleted word with a word which belongs to the same form class (but not the correct word or a synonym) the subject obviously knows something about the constraints on this word, so a replacement which was correct in form class only was arbitrarily given a weight of <u>one</u>. If the subject can give a synonym (but not the correct word) he knows more about the constraints on the word than if he could give only the correct form class, so snyonym replacements were weighted <u>two</u>. A subject who can replace the exact word deleted knows more than if he could give only a synonym, so verbatim replacements were weighted <u>three</u>. Actually, this weighting procedure was a waste of time since the weighted

TABLE II

Form Class	Percentage IG
Concrete Nouns	
Common nouns	46%
Proper nouns	53%
Abstract Nouns	
Verb-nominal	43%
Adj.-nominal	47%
Process	51%
Units	36%
Language	48%
Behavior	54%
Fraction	45%
Group	45%
Verbs	
Copulas	27%
Transitive	47%
Intransitive	45%
Infinitives	39%
Adjectives	47%
Adverbs	38%
Function words	
Articles	29%
Modals	30%
Conjunctions	38%
Prepositions	28%
Pronouns	32%

scores correlated so highly ($r = .99$) with the CT I verbatim scores.

The results of this analysis are contained in Appendix D and a discussion of the results can be found in Coleman's final report of National Science Foundation Research Grant NSF-GB-2604. The most important conclusion based on this analysis is that approximately 65% of the variance in cloze scores can be predicted from formal aspects of the passages.

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APPENDIX A

The M-B Test

M - B TEST

THE INSISTENCE THAT MORALIZING STATEMENTS IN GRAMMAR BE RECOGNIZED AS PERSONAL ASSERTIONS IS A NECESSARY IMPLICATION OF COMPARATIVE AND HISTORICAL LANGUAGE STUDY.

1. MORALIZING STATEMENTS IN GRAMMAR CAN BE INSISTED ON ONLY THROUGH THE PERSONAL ASSERTION THAT IS NECESSARILY IMPLIED BY HISTORICAL AND COMPARATIVE LANGUAGE STUDY.

EXAMINATION OF A SINGLE INDIVIDUAL'S REACTIONS TO A SINGLE ALLEY LEADS TO THE EXPECTATION OF HIS EXPLORING THE ALLEY TO ITS END ON THE FIRST TRIAL PERHAPS.

2. WHEN A SINGLE INDIVIDUAL EXAMINES HIS REACTIONS TO A SINGLE ALLEY, HE PERHAPS EXPECTS TO EXPLORE THE ALLEY TO ITS END ON THE FIRST TRIAL.

3. A SINGLE INDIVIDUAL WHO EXPLORES THE ALLEY TO ITS END ON THE FIRST TRIAL IS PERHAPS DOING WHAT WE EXPECT HIM TO AFTER WE HAVE EXAMINED HIS REACTIONS TO A SINGLE ALLEY.

MEASUREMENT INVOLVES THE PROCESS OF LINKING THE FORMAL MODEL CALLED THE NUMBER SYSTEM TO SOME DISCRIMINABLE ASPECT OF OBJECTS OR EVENTS.

4. MEASUREMENT INVOLVING THE LINKING PROCESS OF THE FORMAL MODEL CALLED THE NUMBER SYSTEM TO SOME ASPECT OF OBJECTS OR EVENTS WHICH IS DISCRIMINABLE.

BECAUSE OF ITS CENTRAL CONCERN WITH HUMAN AND ANIMAL BEHAVIOR, THE RELATIONSHIPS OF PSYCHOLOGY WITH OTHER DISCIPLINES, SCIENCES, AND PROFESSIONS ARE VARIED.

5. SINCE PSYCHOLOGY MAKES HUMAN AND ANIMAL BEHAVIOR ITS CENTRAL CONCERN, IT IS RELATED TO OTHER DISCIPLINES, SCIENCES, AND PROFESSIONS IN VARIED WAYS.

6. PSYCHOLOGY IS RELATED TO OTHER DISCIPLINES, SCIENCES, AND PROFESSIONS IN VARIED WAYS SINCE IT MAKES HUMAN, NOT ANIMAL BEHAVIOR ITS PRIMARY CONCERN.

WE MAY CONSIDER REACTION TO EXTERNAL FACTORS DESIGNED TO INFLUENCE A PERSON'S ATTITUDES AS AN EVALUATION OR JUDGEMENT.

7. WE MAY CONSIDER THAT A PERSON EVALUATES OR JUDGES REACTIONS TO EXTERNAL FACTORS DESIGNED TO INFLUENCE HIS ATTITUDES.

8. WE MAY CONSIDER THAT A PERSON EVALUATES OR JUDGES WHEN HE REACTS TO EXTERNAL FACTORS DESIGNED TO INFLUENCE HIS ATTITUDES.

IN ESSENCE, THE AUTO-INSTRUCTIONAL METHOD PROMOTES THE ORDERLY CONTROLLED DEVELOPMENT OF AN INDIVIDUAL'S SKILL IN MUCH THE SAME WAY AS A GOOD TUTOR MIGHT DO.

9. IN MUCH THE WAY THAT A GOOD TUTOR MIGHT ORDERLY CONTROL THE WAY AN INDIVIDUAL DEVELOPS SKILL, THE AUTO-INSTRUCTIONAL METHOD IN ESSENCE PROMOTES THE SAME.

SERVICING OF MACHINES SHOULD BE REGULAR AND CHECKING OF RECORDING QUALITY SHOULD BE FAIRLY FREQUENT.

10. WHEN ONE SERVICES THE MACHINES REGULARLY HE CHECKS THE QUALITY OF RECORDING FAIRLY FREQUENTLY.

11. One should service the machines regularly along with checking the quality of recording fairly frequently.

The confirmation of an empirical assertion, it should be remembered, is never absolute and final.

12. It should be remembered that we can never absolutely and finally confirm an empirical assertion.

13. When we confirm an empirical assertion, it should be remembered that the assertion is never absolute and final.

The use of different frameworks for the classification of vowels by various linguists and phoneticians can result only in confusion for the students.

14. Because various linguists and phoneticians use different frameworks to classify vowels, students are bound to get confused.

Because skilled workmen are in short supply and labor costs are climbing, the do-it-yourself trend has been established and is growing phenomenally.

15. The shortage of skilled workmen has caused labor costs to climb and thus has been the determining factor in establishing the do-it-yourself trend and causing it to grow so phenomenally.

Growing public school enrollments and an increased awareness of the necessity for testing and counselling are expected to effect an increase in the employment of psychologists in schools.

16. As enrollments in public schools increase and the necessity for testing and counselling becomes more obvious, an expected increase in the employment of psychologists in schools should become a reality.

17. As more students enroll in public schools and as the public becomes aware of educational problems, we can expect more psychologists to use schools for their testing and counselling programs.

There is a decrease in the displacement of the membrane from its original position as the movement proceeds from the center of the disturbance.

18. The membrane is displaced less from its original position as you move from where it is actually being disturbed.

Underlying the concept of performance assessment is the assumption of a continuum of subject-matter skills, varying from low proficiency to high proficiency.

19. We must assume that subject-matter skills vary continuously from low proficiency to high proficiency if we are to assess performance.

20. A continuum of subject-matter skills assumes a concept of assessing performance ranging from low proficiency to high proficiency.

APPENDIX B

TEXT OF THE READING COURSE AND PRACTICE SENTENCES

READING COURSE

It has been proven that students who understand grammatical rules can more easily comprehend what they read. The purpose of this course will be to improve your reading comprehension by teaching you a new type of grammar called transformational grammar. To analyze a complicated sentence by transformational grammar you do not break it up into parts of speech; instead, you analyze it into a number of simple declarative sentences called kernel sentences. For instance, "John is a boy" and "John hit the ball" are both kernel sentences. "John is a good boy" is a sentence which contains two kernel sentences: "John is good" and "John is a boy".

There are many kinds of transformations. It is possible to transform positive kernel sentences into sentences that are negative:

John is lazy. John is not lazy.

is a negative transformation of the positive sentence.

Jane is pretty. Jane is not pretty.
John is coming. John is not coming.
Jane is coming. Jane is not coming.

In each of the above examples the negative sentence is formed by the simple addition of the word <u>not</u> at the proper place. We can express this change as a rule and say that negatives of the first sentence form are formed by the insertion of <u>not</u> after the singular third person verb form <u>is</u>. We can form more complex sentences if the occasion arises. For instance we might change one of our original expressions to indicate a different time.

John is coming. John was coming. John was not coming.

This sequence represents a two stage transformation. One involves a change from present tense to past tense; the other involves a change from positive to negative. Though the transformational theory of grammar states that these rules must be applied one at a time, it is sometimes difficult, even impossible, to state which

COMES FIRST IN THE PROCESS, THOUGH THE NEGATIVE IS USUALLY CONSIDERED TO FOLLOW THE OTHER CHANGE. IN A SIMPLE EXAMPLE SUCH AS THE ONE PROVIDED ABOVE, IT MIGHT BE CONSIDERED THAT IN MANY PRACTICAL INSTANCES MORE THAN ONE STEP IS TAKEN AT THE SAME TIME.

THE TRANSFORMATIONAL THEORY OF GRAMMAR PROVIDES AN ORDERLY, SYSTEMATIC, WAY TO EXPLAIN HOW ALL POSSIBLE SENTENCES IN THE ENGLISH LANGUAGE ARE FORMED. IF WE UNDERSTAND ENOUGH ABOUT THE TRANSFORMATIONAL PROCESS TO DE-TRANSFORM CERTAIN DIFFICULT CONSTRUCTIONS, WE CAN OFTEN ACHIEVE A BETTER AND CLEARER UNDERSTANDING OF THOSE CONSTRUCTIONS. THE PURPOSE OF THIS SHORT COURSE IS TO PROVIDE YOU WITH AN UNDERSTANDING OF A PARTICULAR KIND OF TRANSFORMATION CALLED NOMINALIZATIONS. IF YOU UNDERSTAND THE PROCESS BY WHICH NOMINALIZATIONS ARE PRODUCED, YOU WILL BE ABLE TO DE-TRANSFORM THEM INTO THE "SIMPLER" AND MORE EASILY UNDERSTANDABLE SENTENCE FORMS FROM WHICH THEY WERE DERIVED.

NOMINALIZING IS A METHOD BY WHICH THE SEPARATE IDEAS EXPRESSED IN TWO OR MORE DIFFERENT UNDERLYING SENTENCES CAN BE COMBINED INTO ONE LONGER AND MORE INCLUSIVE SENTENCE. THUS, THROUGH NOMINALIZING WE CAN EXPRESS THE RELATIONSHIPS BETWEEN COMPLEX IDEAS IN A SINGLE SENTENCE INSTEAD OF HAVING TO WRITE A SERIES OF SHORT, SIMPLE SENTENCES FOLLOWED BY COMMENT AND INTERPRETATION. THOUGH IT IS A GREAT ADVANTAGE TO BE ABLE TO COMBINE IN THIS WAY, THESE LONGER SENTENCES ARE SOMETIMES DIFFICULT TO UNDERSTAND, PARTICULARLY WHEN THE READER IS UNAWARE OF THE TRANSFORMATIONAL PROCESSES INVOLVED. WHEN WE NOMINALIZE, THEN, WE CONVERT AN IDEA EXPRESSED SEPARATELY IN ONE WHOLE SENTENCE INTO A SHORT EXPRESSION OF CONCEPT, IDEA, OR PROCESS THAT AS A NOUN, CAN BE USED AS A PART OF A NEW MORE INCLUSIVE SENTENCE; THUS, THE NOMINALIZATION IS THE EXPRESSION THAT RESULTS FROM THE CONVERSION, OR TRANSFORMATION, OF THE UNDERLYING SENTENCE.

SEVERAL EXAMPLES OF TRANSFORMATIONS WILL HELP EXPLAIN THE PROCESS. THE SIMPLE

SENTENCE

THE COMMITTEE SELECTS THE CANDIDATES

GETS TRANSFORMED INTO THE PHRASE

THE COMMITTEE'S SELECTION OF THE CANDIDATE

OR PERHAPS

THE SELECTION OF THE CANDIDATES BY THE COMMITTEE

IN THIS EXAMPLE THE VERB CONSTRUCTION USING SELECTS IS TRANSFORMED INTO AN EXPRESSION THAT INVOLVES NAMING THE PROCESS; THAT IS, THE VERB SELECTS BECOMES THE NOUN SELECTION. WE THEN SAY THAT SELECTS HAS BECOME NOMINALIZED.

ACCOMPANYING MANY NOMINALIZING TRANSFORMATIONS IS ANOTHER TRANSFORMATION, THAT FROM THE ACTIVE TO THE PASSIVE VOICE IN THE VERB OF THE RESULTING SENTENCE. LET US TRACE OUT A SERIES OF TRANSFORMATIONS AS THEY MIGHT OPERATE ON A STRING OF SIMPLE SENTENCES TO COMBINE THEM INTO A MORE COMPLICATED AND CONDENSED EXPRESSION OF THE IDEAS BEING EXPRESSED. WE WILL BEGIN WITH TWO KERNEL SENTENCES:

THE COMMITTEE SELECTS THE CANDIDATES.
WE ARE SURPRISED.

NOMINALIZING THE FIRST SENTENCE WE GET,

THE COMMITTEE'S SELECTION OF THE CANDIDATES

TRANSFORMING THE SECOND SENTENCE WE GET,

SURPRISED US.

COMBINING OUR TWO TRANSFORMATIONS WE NOW END UP WITH,

THE COMMITTEE'S SELECTION OF THE CANDIDATES SURPRISED US.

A FURTHER TRANSFORMATION MIGHT BE MADE. WE COULD CONVERT THE ACTIVE SENTENCE ABOVE INTO THE PASSIVE FORM:

WE WERE SURPRISED BY THE COMMITTEE'S SELECTION OF THE CANDIDATES.

ONLY A LITTLE PRACTICE SHOULD BE REQUIRED TO ENABLE YOU TO MAKE TRANSFORMATIONS FROM THE ACTIVE TO THE PASSIVE VOICE WITH COMPARATIVE EASE. SEE HOW SUCCESSFUL YOU CAN

BE WITH TRANSFORMING THE FOLLOWING ACTIVE EXPRESSIONS INTO THE PASSIVE VOICE:

SOCIETY CAN ATTAIN GOOD.

IF YOU ARE TRANSFORMING CORRECTLY YOU HAVE WRITTEN,

GOOD CAN BE ATTAINED BY SOCIETY.

NOTICE THAT THIS PASSIVE TRANSFORMATION COULD HAVE BEEN WRITTEN RETAINING JUST THE FIRST "GOOD CAN BE ATTAINED", LEAVING THE AGENT, SOCIETY, TO BE PROVIDED BY THE READER FROM HIS OWN EXPERIENCE OR KNOWLEDGE. NOW TRY TO TRANSFORM

WE CAN PROVIDE A CORRECT DEFINITION

INTO A PASSIVE SENTENCE EXPRESSING THE SAME IDEA. THIS TIME YOU SHOULD HAVE WRITTEN

A CORRECT DEFINITION CAN BE PROVIDED BY US.

TRANSFORM THE FOLLOWING ACTIVE SENTENCES INTO PASSIVE ONES:

COMPROMISE IS THE ONLY WAY TO REACH AGREEMENT.

YOU SHOULD HAVE WRITTEN

AGREEMENT CAN BE REACHED ONLY THROUGH COMPROMISE.

IF THEY SEE US, THEY WILL KILL US.

YOU SHOULD HAVE WRITTEN

IF WE ARE SEEN WE WILL BE KILLED.

IN THIS EXAMPLE NOTICE ONCE MORE HOW THE PASSIVE FORM FREQUENTLY LEAVES THE AGENT, OR THE SUBJECT, OF THE ACTIVE FORM TO BE SUPPLIED BY THE READER.

JOHN HAS SHOT JANE.

YOU SHOULD HAVE WRITTEN

JANE HAS BEEN SHOT BY JOHN.

THE TEAM HAS LOST THE GAME.

YOU SHOULD HAVE WRITTEN

THE GAME HAS BEEN LOST BY THE TEAM.

HE HAD TO DESTROY THE CRIPPLED HORSE.

YOU SHOULD HAVE WRITTEN

THE CRIPPLED HORSE HAD TO BE DESTROYED BY HIM.

NOTICE HOW MANY OF THE TRANSFORMATIONS YOU HAVE JUST MADE CAN BE STATED WITHOUT MENTIONING THE AGENT OF THE ACTION IN ANY SPECIFIC WAY. INDEED, IN SEVERAL OF THE PASSIVE CONSTRUCTIONS THE SENTENCES READ BETTER WITH THE ACTOR LEFT OUT.

IF YOU HAVE BEEN ABLE TO TRANSFORM THESE ACTIVE SENTENCES INTO EQUIVALENT PASSIVE CONSTRUCTIONS YOU UNDERSTAND THE ACTIVE - TO - PASSIVE TRANSFORM. NOW YOU ARE READY TO TRY DE-TRANSFORMING THE FOLLOWING PASSIVE SENTENCES INTO THEIR ACTIVE FORMS.

THE PROBLEMS ARE SOLVED IN SIMPLE STEPS.

ALTHOUGH MORE THAN ONE TRANSFORM IS POSSIBLE, A LOGICAL ACTIVE VERSION OF THIS GIVEN SENTENCE WOULD BE

YOU CAN SOLVE THE PROBLEM IN SIMPLE STEPS.

HERE ONCE MORE, NOTICE THAT A TRANSFORMATION FROM PASSIVE TO ACTIVE FREQUENTLY IS REQUIRED TO SUPPLY SOME KIND OF AGENT OR DOER OF ACTION. THE NEXT EXAMPLE DOES NOT REQUIRE YOU TO SUPPLY THE AGENT:

THE HANDWRITING HAS BEEN ANALYZED BY EXPERTS.

HERE WE SIMPLY TURN THE SENTENCE AROUND AND WRITE,

EXPERTS HAVE ANALYZED THE HANDWRITING.

OUR NEXT EXAMPLE AGAIN REQUIRES US TO PROVIDE AN AGENT:

IF THE RESULTS HAD BEEN KNOWN AHEAD OF TIME, HE WOULD NOT HAVE BEEN CHOSEN.

A LOGICAL TRANSFORMATION TO THE ACTIVE FOR THIS SENTENCE WOULD BE,

IF WE HAD KNOWN THE RESULTS AHEAD OF TIME, WE WOULD NOT HAVE CHOSEN HIM.

IN THE NEXT EXAMPLE WE DO NOT HAVE TO SUPPLY ANY ACTOR EITHER BECAUSE IT IS ALREADY IN THE SENTENCE:

THE ROBBERY WAS PLANNED BY EXPERTS.

CAN BE REWRITTEN,

EXPERTS PLANNED THE ROBBERY.

OTHER EXAMPLES,

BILL HIT JOHN.
JOHN WAS HIT BY BILL.

A PELICAN ATE THE FISH.
THE FISH WAS EATEN BY THE PELICAN.

THEY BUILT A HOUSE.
THE HOUSE WAS BUILT BY THEM.

THE ENEMY WOUNDED JOHN.
JOHN WAS WOUNDED BY THE ENEMY.

PASSIVE TO ACTIVE:

THE MAN WAS INFORMED BY HIS WIFE.
HIS WIFE INFORMED HIM.

THE STUDENT WAS INTERESTED IN STUDYING MEDICINE BY HIS DOCTOR.
HIS DOCTOR INTERESTED THE STUDENT IN STUDYING MEDICINE.

BY NOW YOU SHOULD UNDERSTAND THESE RELATIVELY SIMPLE TRANSFORMATIONS FROM ACTIVE TO PASSIVE AND FROM PASSIVE TO ACTIVE. NOW YOU ARE READY TO TRY SOME NOMINALIZING TRANSFORMATIONS. REMEMBER, THEY FOLLOW THE PATTERNS: IF THE GROUP IS TO CONTINUE -- THE CONTINUATION OF THE GROUP; WHEN ASSOCIATE THINGS -- THE ASSOCIATION OF THINGS; WE ARE EXTENDING THE PROCESS -- OUR EXTENSION OF THE PROCESS (EXTENSION OF THE PROCESS); WHEN WE ERR -- TO ERR. REMEMBER ALSO, THAT AS IN THE ACTIVE TO PASSIVE TRANSFORMATION, FREQUENTLY AN AGENT, AN ACTOR, OR A DOER GETS LOST OR DROPS OUT IN THE NOMINALIZATION TRANSFORMATION. NOW YOU ARE READY TO TRY NOMINALIZING. TRANSFORM THE FOLLOWING SENTENCE INTO A NOMINALIZATION CONSTRUCTION:

WE ATTAIN KNOWLEDGE THROUGH HARD WORK.

YOU SHOULD HAVE WRITTEN,

THE ATTAINMENT OF KNOWLEDGE IS THROUGH HARD WORK.

YOU SEE HOW THE ORIGINAL SUBJECT OR DOER GETS LOST IN THE TRANSFORMATION. YOU ALSO SHOULD NOTICE HOW MUCH CLEARER AND MORE DIRECT THE ORIGINAL STATEMENT IS COMPARED TO THE NOMINALIZED VERSION. HERE IS ANOTHER SENTENCE FOR YOU TO NOMINALIZE:

WE EVALUATE OUR SUCCESS BY THE RESULTS WE GET.

THE NOMINALIZED VERSION SHOULD READ,

EVALUATION OF SUCCESS DEPENDS ON RESULTS.

THE NEXT SENTENCE CONTAINS TWO VERB FORMS THAT YOU CAN TRANSFORM:

WE MUST SOLVE THE PROBLEM BEFORE WE CAN DECIDE.

THIS TIME THE TRANSFORMATION BECOMES,

OUR DECISION MUST AWAIT THE SOLUTION OF THE PROBLEM.

IN EACH OF THE SENTENCES ABOVE NOMINALIZATION OF THE VERB RESULTS IN LEAVING OUT A SUBJECT THAT IS PRESENT IN THE NON-NOMINALIZED VERSION.

IT IS NOT TIME FOR YOU TO ATTEMPT TO TRANSFORM NOMINALIZATIONS BACK INTO THEIR DENOMINALIZED FORMS. REMEMBER, YOU MAY OFTEN HAVE TO PROVIDE A SUBJECT THAT HAS BEEN DROPPED IN THE TRANSFORMATION THAT PRODUCED THE NOMINALIZATIONS YOU ARE DEALING WITH.

NOMINALIZATIONS:

THEY PROJECTED THE PICTURES VERY CLEARLY.
THE PROJECTION OF THE PICTURES WAS VERY CLEAR.

DO NOT REJECT THE PROPOSAL.
THE REJECTION OF THE PROPOSAL WAS DETRIMENTAL TO THE PROJECT.

WHEN WE OPERATE THE MACHINE CORRECTLY, THE RESULTS ARE FAVORABLE.
CORRECT OPERATION OF THE MACHINE GIVES FAVORABLE RESULTS.

THE FLOWERS MUST ABSORB SUNLIGHT IF THEY ARE TO GROW.
THE ABSORBTION OF SUNLIGHT IS NECESSARY TO THE GROWTH OF FLOWERS.

WE MUST ABBREVIATE THE WORDS BEFORE WE CAN WORK THE EXERCISE.
THE WORKING OF THE EXERCISE DEPENDS UPON THE ABBREVIATION OF THE WORDS.

WE WILL COLLECT BUTTERFLIES AS OUR PROJECT.
THE COLLECTION OF BUTTERFLIES WILL BE OUR PROJECT.

THE OFFICIALS WILL INTEGRATE THE GRADE SCHOOLS NEXT FALL.
INTEGRATION WILL TAKE PLACE IN THE GRADE SCHOOLS NEXT FALL.

THE STUDENTS OBSERVED THE EXPERIMENTS CLOSELY.
CLOSE OBSERVATION OF THE EXPERIMENTS REVEALED MANY INTERESTING FACTS.

THE DISCOVERY OF A BOY'S FASCINATION WITH A PRETTY GIRL LEADS TO THE CONCLUSION OF HIS ASKING HER FOR A DATE AS SOON AS POSSIBLE.

1. WHEN A BOY DISCOVERS HIS FASCINATION WITH A PRETTY GIRL HE CONCLUDES TO ASK HER FOR A DATE AS SOON AS POSSIBLE.

2. A BOY WHO ASKS A PRETTY GIRL FOR A DATE AS SOON AS POSSIBLE IS DOING WHAT WE CONCLUDE HE WILL WHEN WE DISCOVER HIS FASCINATION WITH HER.

WE MAY THINK OF CAPE-WAVING AT THE CHARGE OF THE BULL TO KILL THE MATADOR AS DECEPTION.

3. WE MAY THINK THAT THE MATADOR DECEIVES THE CAPE-WAVING AT THE CHARGE OF THE BULL TO KILL HIM.

4. WE MAY THINK THAT THE MATADOR DECEIVES WHEN HE WAVES HIS CAPE AT THE CHARGE OF THE BULL TO KILL HIM.

BECAUSE IT CONSIDERS BOTH HEREDITARY AND ENVIRONMENTAL FACTORS, THE CORRESPONDENCE OF THE THEORY WITH THE FACTS IS HIGH.

5. SINCE THE THEORY CONSIDERS BOTH ENVIRONMENTAL AND HEREDITARY FACTORS, IT CORRESPONDS HIGHLY WITH THE FACTS.

6. THE THEORY CORRESPONDS HIGHLY WITH THE FACTS SINCE IT CONSIDERS HEREDITARY AND NOT ENVIRONMENTAL FACTORS.

INSTALLATION REQUIRES THE WORK OF BOLTING THE FLANGE CALLED THE BASE TO SOME PERMANENT PART OF THE STRUCTURE.

7. INSTALLATION REQUIRING THE BOLTING OF THE FLANGE CALLED THE BASE TO SOME PART OF THE STRUCTURE WHICH IS PERMANENT.

GROWING PRIVATE INDUSTRY USE AND INCREASED APPRECIATION OF THE NECESSITY FOR GOVERNMENTAL EXPERIMENTING AND PLANNING ARE CALCULATED TO PRODUCE A NEW ATTITUDE TOWARD THE USE OF PESTICIDES IN AGRICULTURE.

8. AS MORE PRIVATE INDUSTRIES USE PESTICIDES AND AS THE PUBLIC BECOMES AWARE OF AGRICULTURAL PROBLEMS, WE CAN EXPECT THE GOVERNMENT TO USE INDUSTRY FOR THEIR EXPERIMENTING AND PLANNING PROGRAMS.

9. AS USE IN PRIVATE INDUSTRY GROWS AND THE NECESSITY FOR GOVERNMENTAL EXPERIMENTING AND PLANNING BECOMES MORE APPRECIATED, A CALCULATED NEW ATTITUDE TOWARD THE USE OF PESTICIDES IN AGRICULTURE SHOULD BECOME A REALITY.

BEHIND THE IDEA OF INDIVIDUAL INVESTMENT IS THE BELIEF IN THE STEADINESS OF THE ECONOMY IN GROWING TO EVER INCREASING SIZE.

10. WE MUST BELIEVE THAT THE ECONOMY IS GROWING STEADILY TO EVER INCREASING SIZE IF INDIVIDUALS ARE TO INVEST.

11. A STEADINESS OF THE ECONOMY BELIEVES IN THE IDEA OF INDIVIDUAL INVESTMENT GROWING TO EVER INCREASING SIZE.

THERE IS AN INCREASE IN THE MOVEMENT OF THE PARTS AS THE MACHINE GETS OLDER.

12. THE PARTS OF THE MACHINE MOVE MORE AS THE MACHINE GETS OLDER.

FUNDAMENTALLY, THE ARTIFICIAL HORMONES PRODUCE THE CAREFULLY REGULATED GROWTH OF THE ORGANISM LIKE THE NATURAL HORMONES.

13. LIKE THE NATURAL HORMONES CAREFULLY REGULATE HOW THE ORGANISM GROWS, THE ARTIFICAIL HORMONES, FUNDAMENTALLY, PRODUCE THE SAME.

ATTENDENCE AT CLASS SHOULD BE 100% AND ATTENTION SHOULD BE PAID TO THE LECTURES.

14. ONE SHOULD ATTEND CLASS 100% ALONG WITH PAYING ATTENTION TO THE LECTURES.

15. WHEN ONE ATTENDS CLASS 100% HE PAYS ATTENTION TO THE LECTURES.

THE PROVING OF A METAPHYSICAL STATEMENT, YOU KNOW, IS NOT POSSIBLE.

16. YOU KNOW THAT WE CANNOT POSSIBLY PROVE A METAPHYSICAL STATEMENT.

17. WHEN WE PROVE A METAPHYSICAL STATEMENT, YOU KNOW, THE STATEMENT IS NOT POSSIBLE.

THE DEALING IN LARGE QUANTITIES AT LOW COST BY DISCOUNT HOUSES LEADS TO MORE BUYING BY CONSUMERS.

18. BECAUSE DISCOUNT HOUSES DEAL IN LARGE QUANTITIES AT LOW COST, CONSUMERS BUY MORE.

THE PROVISION THAT ALL STUDENTS BE REGARDED AS INDIVIDUALS IS A FURTHER SUGGESTION OF THE ADMINISTRATION.

19. ALL STUDENTS CAN PROVIDE AS INDIVIDUALS IS FURTHER SUGGESTED BY THE ADMINISTRATION.

APPENDIX C

Cloze passages with readability and Information Gain scores

THE CODE NUMBER AT THE TOP OF EACH PASSAGE IS INTERPRETED AS FOLLOWS:

MC- __ MEANS THAT THE PASSAGE WAS ADAPTED FROM STANDARD TEST LESSONS IN READING BY MCCALL AND CRABBS. THE LETTER FOLLOWING THE MC IDENTIFIES THE BOOKLET FROM WHICH THE PASSAGE WAS TAKEN. THESE PASSAGES ARE ON DEPOSIT WITH THE PERMISSION OF THE BUREAU OF PUBLICATIONS, COLUMBIA UNIVERSITY, NEW YORK.

AB, MEANS THAT THE PASSAGE WAS ADAPTED FROM TEXTBOOK OF ABNORMAL PSYCHOLOGY BY ROY M. DORCUS AND G. WILSON SHAFFER. THESE PASSAGES ARE ON DEPOSIT WITH THE PERMISSION OF THE WILLIAMS AND WILKINS CO., BALTIMORE, MD.

G, MEANS THAT THE PASSAGE WAS ADAPTED FROM THE HUMAN SENSES BY GELDARD.

H, MEANS THAT THE PASSAGE WAS ADAPTED FROM HANDBOOK OF EXPERIMENTAL PSYCHOLOGY EDITED BY STEVENS.

PASSAGES MARKED G AND H ARE ON DEPOSIT WITH THE PERMISSION OF JOHN WILEY AND SONS, INC., N.Y.

L, MEANS THAT THE PASSAGE WAS ADAPTED FROM EITHER READING MODERN FICTION, EDITED BY WINIFRED LYNSLEY OR THE HOUSE OF FICTION BY CAROLINE GORDON AND ALLEN TATE. THESE PASSAGES ARE ON DEPOSIT WITH THE PERMISSION OF CHARLES SCRIBNER'S SONS, N. Y., WHO HOLD THE COPYRIGHTS ON THIS MATERIAL.

THE FIRST NUMBER FOLLOWING THE LETTERS IDENTIFYING THE SOURCE OF THE PASSAGE REPRESENTS THE PERCENTAGE OF CORRECT RESPONSES (THE EXACT WORD DELETED WAS REPLACED) ON CLOZE TESTS IN WHICH EVERY FIFTH WORD WAS DELETED.

THE SECOND NUMBER REPRESENTS THE PERCENTAGE OF CORRECT RESPONSES ON CLOZE TESTS IN WHICH ONLY ONE WORD PER PASSAGE WAS DELETED.

THE THIRD NUMBER REPRESENTS THE PERCENTAGE OF CORRECT RESPONSES WHEN SUBJECTS WERE REQUIRED TO GUESS EVERY WORD AFTER HAVING SEEN THE PRECEDING WORDS IN THE PASSAGE.

THE FOURTH NUMBER REPRESENTS THE PERCENTAGE OF NEW CORRECT RESPONSES WHEN THE SAME SUBJECTS WERE AGAIN REQUIRED TO GUESS EVERY WORD IN THE PASSAGE.

MC-D .782 .782 .421 .388

A NOBLEMAN AND A MERCHANT MET IN A TAVERN. FOR THEIR LUNCH THEY ORDERED SOUP. WHEN IT WAS BROUGHT, THE NOBLEMAN TOOK A SPOONFUL, BUT THE SOUP WAS SO HOT THAT HE BURNED HIS MOUTH AND TEARS CAME TO HIS EYES. THE MERCHANT ASKED WHY HE WAS WEEPING. THE NOBLEMAN WAS ASHAMED TO ADMIT HE HAD BURNED HIS MOUTH AND ANSWERED, "SIR, I ONCE HAD A BROTHER WHO COMMITTED A GREAT CRIME, FOR WHICH HE WAS HANGED. I WAS THINKING OF HIS DEATH, AND THAT MADE ME WEEP." THE MERCHANT BELIEVED THIS STORY AND BEGAN TO EAT HIS SOUP. HE TOO BURNED HIS MOUTH, SO THAT HE HAD TEARS IN HIS EYES. THE NOBLEMAN NOTICED IT AND ASKED THE MERCHANT, "SIR, WHY DO YOU WEEP?" THE MERCHANT, WHO NOW SAW THE NOBLEMAN HAD DECEIVED HIM, ANSWERED, "MY LORD, I AM WEEPING BECAUSE YOU WERE NOT HANGED TOGETHER WITH YOUR BROTHER."

MC-C .658 .773 .398 .447

I AM GOING TO TELL YOU A STORY ABOUT GENERAL ULYSSES GRANT. IT WAS TOLD TO ME BY MY GRANDFATHER, WHO WENT TO SCHOOL WITH GRANT WHEN THE BOTH OF THEM WERE LIVING IN MAYSVILLE, KENTUCKY.

ONE DAY WHEN GRANT WAS PLAYING MUMBLETY-PEG AT RECESS, HE LOST THE GAME, WHICH MEANT, OF COURSE, THAT HE WOULD HAVE TO "ROOT THE PEG." EACH BOY GAVE IT A LICK WITH HIS KNIFE, AND, AS THERE WERE SEVERAL BOYS IN THE GAME, THE PEG WAS DRIVEN ALMOST ENTIRELY INTO THE GROUND.

JUST AS ULYSSES GOT THE PEG FIRMLY BETWEEN HIS TEETH, THE SCHOOL BELL RANG.

MY GRANDFATHER AND THE OTHER BOYS RAN INTO LINE, CALLING "COME ON OR YOU'LL GET A LICKING FOR BEING LATE," BUT IT WAS SEVERAL MINUTES AFTER THEY WERE SEATED BEFORE GRANT APPEARED IN THE DOORWAY, A BLACK RING AROUND HIS MOUTH AND THE PEG STILL BETWEEN HIS TEETH.

MC-C .685 .753 .344 .421

Most ants are hard workers and often work from six o'clock in the morning until ten o'clock at night. The work is divided among the worker ants so that each one has a certain amount to do. We do not know how they decide what each one is to do, for they do not talk. Some people think ants follow each other by their sense of smell. Ants often live to be a year old, and some have been known to live six or seven years. One way they get their food is from plant lice, which we might call their cows. The ants milk these "cows" by tapping the lice gently until a drop of honey comes out. Then they eat the honey. Ants take very good care of these plant lice and often they build a covering over them so that they will be protected from the rain.

MC-A .683 .740 .386 .476

My young friend Jack was counting the contents of his bank -- one, two, three pennies, a nickel, a dime, and a quarter. Over and over he tried, but each time he found forty-three cents, no more. He needed so many things, a baseball, a mitt, and a bat. What should he do? He must earn some money, of course, but how? He thought and thought a long time. Then, taking a pencil and paper, he made a list of all the people who might need the help of a strong, willing boy. There were Farmer Brown, with weeds to be pulled; Mr. Jones, the grocer, with boxes to be carried; Miss White, the milliner, with hats to be delivered; and many others. The next morning he started out merrily with his list. The last time I saw Jack he was playing with a new mitt and bat of his own.

MC-A .685 .731 .344 .448

New Year's Eve, or St. Basil's Eve as it is called in Greece, is a happy time for Greek children. Boys and girls go out carrying lanterns and baskets, singing carols as they go. When all have had their baskets filled with fruit and pennies by those who listen, they return to their homes. Then comes the gayest time of all, for the family gathers around the St. Basil's cake. This cake is very large and has in the center an olive branch which the children decorate while they sing. The father asks the blessing of St. Basil and cuts the cake, which contains a silver coin. The first piece of cake is set aside for God, the next for St. Basil, and then one is given to each person in the family. Whoever finds the silver coin in his piece will be the luckiest person in the year ahead.

MC-B .705 .727 .410 .396

Katy's mother asked her to dust the living room and to make her own room tidy. Katy disliked dusting. She started to dust slowly. She neglected to dust one of the arms of the big chair in the corner. She skipped the legs of the table by the window. In another corner stood a tall grandfather clock. She could not reach the top, so she did not dust up there at all. Katy thought she was alone in the room, but suddenly she heard someone talking. It was the grandfather clock. It said slowly again and again, "Lazy Ka-ty, lazy Ka-ty!" This made Katy so ashamed that she started her task again, dusting more carefully. She finished dusting the living room and hurried upstairs to her own room. The little clock there was also talking to her. It said as fast as it could, "Busy Katy, busy Katy, busy Katy!"

MC-B .672 .722 .408 .416

TWO MULES WERE GOING ALONG A LONELY ROAD. ONE HAD A LOAD OF CORN, THE OTHER A LOAD OF GOLD. THE ONE THAT CARRIED THE GOLD WAS SO PROUD OF HIS BURDEN THAT HE WOULD NOT HAVE ANY OF IT TAKEN OFF, THOUGH IT WAS A HEAVY LOAD TO CARRY. HE WALKED ALONG WITH HIS HEAD HELD HIGH, JINGLING THE BELLS ON HIS BRIDLE AT EVERY STEP.

SOON SOME ROBBERS CAME ALONG AND STOPPED THE MULES. THE ONE THAT WAS CARRYING THE CORN WAS ALLOWED TO GO, BUT THE ONE WITH THE LOAD OF GOLD WAS HELD. HE KICKED AND BIT TO DRIVE AWAY THE ROBBERS, BUT THEY WANTED THE GOLD; SO THEY STABBED HIM TO THE HEART. AS HE LAY DYING, HE SAID, "IT IS NOT ALWAYS WELL TO HAVE GREAT DUTIES. IF I, LIKE MY BROTHER, HAD BEEN DOING A SIMPLE TASK, MY LIFE WOULD HAVE BEEN LONGER."

MC-C .605 .722 .359 .455

IN THE NETHERLANDS AND BELGIUM CHILDREN DO NOT HAVE THEIR FUN AND PRESENTS ON CHRISTMAS DAY AS WE DO. THEY GO TO CHURCH ON CHRISTMAS DAY, AND THEY HAVE THEIR FUN ON ST. NICHOLAS DAY, WHICH COMES ON DECEMBER 6. THE NIGHT BEFORE, THEY FIX SOMETHING TO HOLD THEIR GIFTS. SOMETIMES IT IS A WELL-POLISHED SHOE, SOMETIMES A PLATE OR A BASKET, AND SOMETIMES THEY HANG UP THEIR STOCKINGS JUST AS WE DO. ST. NICHOLAS RIDES A GRAY HORSE OR A WHITE DONKEY AND SO THE CHILDREN LEAVE WATER FOR THE ANIMAL TO DRINK AND SOMETHING FOR IT TO EAT. THEY LEAVE HAY OR OATS OR A CARROT, AND SOMETIMES A PIECE OF BREAD. IN THE MORNING, IF THEY HAVE BEEN GOOD, THEY FIND THAT ST. NICHOLAS HAS LEFT SWEETS AND FRUITS AND PLAYTHINGS FOR THEM. BUT IF THEY HAVE BEEN BAD THEY FIND ONLY A ROD OR A SWITCH.

MC-B .590 .720 .420 .376

To make a number game, take a piece of cardboard that is ten inches square. A box lid may be used. Lay a ruler along the top edge with the end just touching the left-hand corner. Make a dot with a pencil at the one inch mark, at the two inch mark, and at the three, four, five, six, seven, eight, and nine inch marks. Turn the card around and do the very same on each edge. Lay your ruler on the card from the first dot at the top to the one just opposite at the bottom and draw a line joining the dots. Do this with all the dots and you will have one hundred one-inch squares on the card. With a colored crayon mark a number in each square using numbers from one to nine. In our next lesson we shall learn how to play this game.

MC-A .708 .709 .351 .455

The children were telling about their Christmas vacations.

"We went to Kansas," said Jack. "One day when we were skating on the lake some of the boys cut a hole in the ice, struck a match, and a fire blazed right up out of the hole for two or three minutes."

"Oh, no," said all the others, "that couldn't be true! Water doesn't burn."

"But it is true that the water burned," said Jack. "I saw it."

They turned to the teacher to see what she would say and she explained this very strange happening. It seems there are natural gas wells under the lake which send the gas bubbling up through the water. When the lake is frozen the gas is caught in large pockets under the ice.

"So you see," said the teacher, "when a hole is cut in the ice the escaping gas will burn if lighted."

MC-B .653 .700 .433 .344

WHEN YOU HAVE FINISHED MAKING THE FRAME OF THE KITE, GET A PIECE OF STRONG TISSUE PAPER. CUT IT THE SHAPE OF A DIAMOND, JUST HALF AN INCH LARGER THAN THE FRAME. TURN THE FOUR EDGES OF THE PAPER OVER THE STRING AND PASTE THEM. NOW THE MAIN PART OF THE KITE IS READY. NEXT MAKE A TAIL FOR THE KITE. GET A PIECE OF CORD ABOUT THIRTY INCHES LONG. CUT SOME PAPER INTO SMALL PIECES, EACH ABOUT TWO INCHES LONG AND ONE INCH WIDE. TIE THESE PIECES OF PAPER ONTO THE CORD ABOUT THREE INCHES APART. THIS IS THE TAIL OF THE KITE. TIE IT TO ONE OF THE LONGER TIPS OF THE DIAMOND-SHAPED KITE. THE LAST THING TO DO IS TO ATTACH THE END OF A BALL OF TWINE AT THE POINT WHERE THE STICKS ARE TIED TOGETHER. YOUR KITE IS NOW READY TO FLY IN THE AIR.

MC-A .615 .696 .360 .396

WHEN I WAS A LITTLE GIRL, I SPENT SEVERAL HOURS OF ALMOST EVERY DAY IN A LARGE LUMBER MILL. I LIKED TO LISTEN TO THE SCRAPING AND GRINDING OF THE MACHINERY AND WATCH ALL THE BUSY MEN AT WORK. MY FATHER MADE A COMFORTABLE LITTLE SEAT FOR ME, WHERE I COULD SIT AND WATCH THE SHARP SAWS CUT THROUGH THE BIG LOGS, SCATTERING SPARKS AND SAWDUST. THE MEN WOULD CUT OFF THE CLEAN WHITE BOARDS JUST AS EASILY AS IF THE BIG LOGS HAD BEEN MADE OF CHOCOLATE FUDGE. THERE WAS A FRESH, WOODY SMELL IN ALL PARTS OF THE LARGE MILL. THE SMELL AND THE NOISE OF ALL THE BUSY MACHINES WOULD OFTEN MAKE ME DROWSY AND I WOULD FALL ASLEEP AND HAVE HAPPY DREAMS. THEN I WOULD WAKE UP AND FIND A JOLLY BIG LUMBERJACK SMILING DOWN AT ME, ALL READY TO TEASE ME ABOUT BEING A SLEEPYHEAD.

MC-C .593 .696 .403 .407

Do you wish you could look deep into the ocean and see how sea animals live? It is as though you were doing this when you visit the Oceanarium at Marineland, Florida. Here millions of gallons of sea water have been pumped into great tanks. In this water live thousands of sea animals, from delicate angelfish to man-eating sharks, and from huge turtles so old and slow that moss has grown on their shells to streamlined and ever playful porpoises. You can watch them through large windows that are built in the sides of the tanks. Only an inch or two of clear glass separates you from the shark's sharp teeth. Four times a day, protected by a heavy wire shield and a short spear, a man dives down among these sea animals with a basket of food. He feeds the sharks first to keep them from feeding on him.

MC-B .623 .687 .319 .497

A long time ago the little fishes of the sea were at school down under the water, safe from dangerous animals. One pupil, Jimmie Cod, was not studying. He was looking at something dangling in front of him. He could not take his eyes off this shiny object. When the teacher of history asked him what he thought of the whale that swallowed Jonah, he replied, "It looks good enough to eat." Everyone was amused at Jimmie's strange answer and all turned to look at him. He was not thinking of school or history lessons, but he was getting hungrier every minute. Suddenly, while teacher and pupils were looking -- it happened! Jimmie took a quick bite and swallowed that shiny something which had been hanging just before his nose. Then like a flash he went up, up, out of sight! And no one in the class saw Jimmie Cod again!

MC-C .630 .680 .377 .393

This is a game called Monkeys Fly, which can be played in a classroom on a rainy day. Let one person be IT. The others should all stand. IT stands before them, says "Birds fly," and throws up his arms as if he were flying. Then he says "Owls fly," and throws up his arms in the same way. The other players are to throw up their arms also. IT mentions several fowls that fly, and then he suddenly says "Monkeys fly," and throws up his arms. Everyone who then throws up his arms must sit down. IT starts again, and after mentioning several other fowls he may suddenly say "Pigs fly." Those who lift their arms this time must sit down. Several animals may be said to fly, but players like to mention monkeys most frequently. The last one to sit down may be IT for the next game.

MC-A .630 .667 .343 .451

Mount Everest, the highest mountain in the world, is approximately 29,000 feet high. Many lives have been lost trying to reach its summit on foot. Some climbers may have reached the top before 1952, but if so, they did not return to tell the story. A Swiss team tried it in 1952 and failed. Later, a team led by the British succeeded. The British felt they had learned so much from the Swiss that they cabled them this message, "Half glory to you."

After the British success, the Swiss tried again. Numbing cold and raging blizzards tried to stop them, but this time they succeeded. The summit was reached twice by different parties. In addition, they scaled the never-before-climbed neighboring peak Lhotse — the world's fourth highest, with an altitude of about 28,000 feet. When the Swiss returned from these climbs, they cabled the British this message, "All glory to you."

MC-D .557 .667 .350 .430

WE WERE ALL READY FOR THE TRAIL WITH OUR PACKS STRAPPED ON SECURELY. WE FOLLOWED THE TRAIL NEARLY ALL DAY, EXCEPT WHEN WE STOPPED TO LUNCH BY THE SIDE OF A HIGH CLIFF. BY SUNDOWN WE WERE ANXIOUSLY LOOKING FOR A PLACE TO CAMP FOR THE NIGHT. WE GATHERED A HUGE STACK OF EUCALYPTUS BRANCHES TO HAVE READY FOR OUR FIRE. AFTER SUPPER WE ROLLED UP IN OUR BLANKETS NEAR THE FIRE AND WE WERE SOON ASLEEP. WE WERE AWAKENED BY VERY QUEER SOUNDS WHICH MY FRIEND RECOGNIZED AS HOWLS OF A JAGUAR. WE HASTILY HEAPED MORE BRANCHES ON THE FIRE THAT WAS BURNING LOW. WE PLAYED OUR UKULELES AND SANG. BY MEANS OF MUCH LIGHT AND NOISE WE KEPT ALL CREATURES AWAY EXCEPT AN INQUISITIVE DEER AND SEVERAL RABBITS AND SQUIRRELS. WE FELL ASLEEP TOWARD DAWN AND WE WERE NOT BOTHERED AGAIN DURING OUR STAY IN THE CANYON.

MC-B .557 .656 .341 .419

THE CHEROKEE INDIANS SAY THAT UKTENA WAS THE MOST TERRIBLE ANIMAL THAT EVER LIVED IN AMERICA. ITS DEN WAS IN DARK NANTAHALA GORGE IN WESTERN NORTH CAROLINA. IT WAS A SNAKE AS BIG AS A TREE TRUNK AND A MILE LONG. ITS ONE EYE, BETWEEN TWO HORNS, WAS A PRECIOUS GEM. WHOEVER WAS SEEN BY THAT EYE DIED.

ANY INDIAN WHO WAS BRAVE ENOUGH TO KILL UKTENA AND GET THAT EYE WOULD BE ABLE TO KNOW THE FUTURE. MANY TRIED AND DIED. AT LAST A VERY BRAVE CHEROKEE SHOT UKTENA WITH AN ARROW WHILE THE SNAKE WAS STRETCHED ALONG THE TOP OF CLIFF MOUNTAIN. UKTENA WRITHED BACK AND FORTH ACROSS NANTAHALA GORGE, TORE UP TREES AS IT ROLLED DOWN THE MOUNTAIN, AND DIED AT THE BOTTOM OF THE GORGE. THE BRAVE INDIAN REMOVED THE GEM, AND THE STORY GOES THAT IT IS KEPT BY EACH SUCCEEDING CHIEF OF THE CHEROKEES.

MC-D .532 .649 .294 .444

A GREAT BLACK AND YELLOW V-2 ROCKET FORTY-SIX FEET LONG STOOD IN A NEW MEXICO DESERT. EMPTY, IT WEIGHED FIVE TONS. FOR FUEL IT CARRIED EIGHT TONS OF ALCOHOL AND LIQUID OXYGEN.

EVERYTHING WAS READY. SCIENTISTS AND GENERALS WITHDREW TO SOME DISTANCE AND CROUCHED BEHIND EARTH MOUNDS. TWO RED FLARES ROSE AS A SIGNAL TO FIRE THE ROCKET.

WITH A GREAT ROAR AND BURST OF FLAME THE GIANT ROCKET ROSE SLOWLY AND THEN FASTER AND FASTER. BEHIND IT TRAILED SIXTY FEET OF YELLOW FLAME. SOON THE FLAME LOOKED LIKE A YELLOW STAR. IN A FEW SECONDS IT WAS TOO HIGH TO BE SEEN, BUT RADAR TRACKED IT AS IT SPED UPWARD AT 3,000 MILES PER HOUR.

A FEW MINUTES AFTER IT WAS FIRED, THE PILOT OF A WATCHING PLANE SAW IT RETURN AT A SPEED OF 2,400 MILES PER HOUR AND PLUNGE INTO EARTH FORTY MILES FROM THE STARTING POINT.

MC-A .587 .642 .338 .443

SWAT ONE MALE AND ONE FEMALE FLY IN EARLY SPRING AND YOU WILL KILL ABOUT 340,000,000,000,000 FLIES THAT THEY AND THEIR YOUNG WOULD HAVE PRODUCED BY THE END OF THE SUMMER. LET LIVE A SPIDER WHICH YOU ARE ABOUT TO KILL AND IT WILL KEEP FROM BEING BORN MORE FLIES THAN THE STARS YOU CAN SEE ON A CLEAR NIGHT. OR KEEP ALIVE ONE BIRD OR A LIZARD, AND YOU WILL HAVE KILLED A BILLION TIMES A BILLION FLIES. IF THERE WERE NO NATURAL ENEMIES OF FLIES, THE WORLD WOULD BE COVERED WITH THEM.

WHY KILL FLIES? ON THEIR STICKY FEET AND HAIRY BODIES AND IN THEIR SUCKING MOUTHS THEY CARRY MANY MILLIONS OF GERMS, AND BRING SOME FORTY KINDS OF DISEASE. THEY ARE BORN IN FILTH, AND BRING THAT FILTH TO YOU.

SO SWAT THE FLY! BUT BETTER STILL, PROTECT ITS ENEMIES AND CLEAN UP ITS BREEDING PLACES.

MC-D .470 .640 .309 .403

THEIR AIRPLANE HAD BEEN FORCED DOWN AT SEA. THEY BARELY HAD TIME TO INFLATE THE YELLOW RUBBER DINGHIES AND CLIMB INTO THEM BEFORE THE PLANE SANK. WOULD A RESCUE PLANE FIND THEM? ONE DID FINALLY. TO THE SURPRISE OF THE ANXIOUS WATCHERS, THEY SAW A BOAT HANGING UNDER IT. THE BOAT WAS AIMED AND DROPPED FROM THE PLANE. PARACHUTES OPENED AND LET IT DOWN GENTLY ABOUT A HUNDRED YARDS FROM THE DINGHIES. A SEA ANCHOR SHOT FROM THE FRONT. A LONG, LIGHT LINE SHOT FROM EACH SIDE.

WHEN THE MEN PULLED THEMSELVES INTO THE BOAT BY THESE LINES, THEY FOUND IT EQUIPPED WITH TWO OUTBOARD MOTORS, SAILS, COMPASS, CHARTS, WATERPROOFED INSTRUCTIONS FOR EVERYTHING IN FOUR LANGUAGES, DRY CLOTHES, FOOD, CIGARETTES, KNIVES, FISHING TACKLE -- EVERYTHING BUT A WELCOME MAT. ALL THIS WAS PROVIDED TO MAKE SURE THAT THEY WOULD KEEP AFLOAT AND ALIVE UNTIL THEY COULD MAKE HARBOR OR BE RESCUED.

MC-C .562 .622 .330 .363

THE ELECTRIC EEL, A NATIVE FISH OF SOUTH AMERICA, DEFENDS ITSELF FROM ATTACKS OF ENEMIES BY A NATURAL ELECTRIC BATTERY. A DISCHARGE FROM THIS BATTERY IS POWERFUL ENOUGH TO STUN EVEN THE LARGEST ANIMALS. WHERE ROADS PASS THROUGH PONDS FREQUENTED BY THESE PECULIAR FISH, IT HAS OFTEN BEEN FOUND NECESSARY TO CHANGE THE LINE OF THE ROAD FOR FEAR OF THEM.

THESE FISH ARE USED FOR FOOD BY THE NATIVE INDIANS, BUT THEY ARE DANGEROUS TO CATCH BECAUSE OF THEIR ABILITY TO SHOCK THE FISHERMEN. IN ORDER TO OVERCOME THIS DIFFICULTY, THE INDIANS HAVE DEVISED A VERY INGENIOUS METHOD OF DISARMING THE FISH. HORSES ARE DRIVEN INTO THE PONDS AND THE EELS EXPEND THEIR ELECTRICAL CHARGE ON THE HORSES. THEN THE FISH ARE EASILY HARPOONED AND CAUGHT. IT IS ONLY AFTER A LONG REST AND SOME FOOD THAT THEY ARE ABLE TO BUILD UP ABILITY TO SHOCK THEIR ENEMIES AGAIN.

MC-E .478 .609 .341 .379

When the Spaniards came to Colombia, South America, they were told of a tribe of Indians who possessed fabulous wealth. Many years before, the wife of an Indian chief had thrown herself into a lake to escape punishment and had become the goddess of the lake. Because they believed she had the power to make their tribe prosperous and victorious, whenever a new chief was chosen this tribe made a grand pilgrimage to Lake Guatavita to honor the goddess and take her presents. First in the procession came wailing men, who bore signs of mourning for the chief who had died; then came men decked with ornaments of gold and emeralds, with feathers in their hair; then braves in jaguar skins; then priests in black robes and tall caps. Finally came the nobles and chief priests, among them the new chief, who rode in a barrow covered with gold disks.

MC-E .437 .597 .335 .347

Space is said to be pervaded by ether, an invisible medium by which all waves of energy are thought to be transmitted. Of these ethereal vibrations, the most important for plants are the light waves, since all plants grow by the action of light, which a substance in their leaves converts into energy.

Various species of plants, however, thrive best on different varieties of what we call light. For example, there is a marked difference between sunlight and moonlight, owing to the fact that the vibrations of light from the sun run in all directions, but the vibrations of moonlight are polarized and run in one direction only. Certain plants, such as the cucumber, thrive best in this polarized light.

Since the discovery of this scientific fact, various experimental farms have been established where the light has been polarized in order to further the growth of certain species of plants.

Ab .358 .531 .210 .330

THE VARIOUS APPROACHES TO PROBLEMS OF DISORDER OF ASSOCIATION AND MEMORY LEAD TO SEVERAL POSSIBLE METHODS OF CLASSIFICATION. ONE METHOD WOULD BE TO FOLLOW THE CONVENTIONAL SCHEMES ADOPTED IN MOST OF THE ELEMENTARY TEXT-BOOKS OF PSYCHOLOGY. THIS METHOD IS UNSATISFACTORY SINCE THE TREATMENT OF THE TOPICS IS LARGELY DESCRIPTIVE. ANOTHER METHOD THAT HAS BEEN USED IS DEVELOPED ON A BASIS OF THE NEUROLOGICAL STRUCTURES THAT ARE INVOLVED IN THE PROCESSES. THIS METHOD ALSO AFFORDS DIFFICULTIES SINCE THE NEUROLOGICAL STRUCTURES ARE NOT SUFFICIENTLY WELL UNDERSTOOD IN MANY CASES TO WARRANT DEFINITE CONCLUSIONS. A THIRD APPROACH, CARRIED OVER IN PART FROM NEUROLOGY AND IN PART FROM PSYCHIATRY, CLASSIFIES THE DISORDERS IN TERMS OF THE MAJOR SYMPTOMS EXHIBITED BY THE PATIENT. NO SINGLE CLASSIFICATORY SCHEME SEEMS TO BE ADEQUATE BECAUSE OF THE COMPLEXITY OF THE PHENOMENA WITH WHICH WE HAVE TO DEAL AND BECAUSE OF THE CONFUSION IN TERMINOLOGY THAT EXISTS AT PRESENT.

L .350 .527 .248 .364

THE COMMENTS, QUESTIONS, AND ANALYSES WHICH ACCOMPANY THE BOOK ARE NOT TO BE REGARDED AS THE DOGMATIC INTERPRETATIONS OF THE STORIES. THEY ARE INTENDED PRIMARILY TO SERVE THE STUDENT BY DIRECTING HIS ATTENTION TO DETAILS WHOSE SIGNIFICANCE HE MIGHT OTHERWISE MISS. WHEN A STUDENT HAS LEARNED, IN BROWNING'S PHRASE, THAT IN GOOD FICTION A DETAIL "MEANS INTENSELY," HE IS ON HIS WAY TO BECOMING A GOOD READER. ASIDE FROM THE FORMAL ANALYSES, THE CRITICAL AIDS COMBINE COMMENT AND QUESTION, AS IN A NATURAL CLASSROOM DISCUSSION, AND ARE SPECIFICALLY DESIGNED NOT TO GIVE THE STORY AWAY TO THE READER IN ADVANCE OF THE READING. THE BOOK CONTAINS TWO FORMAL ANALYSES: A SHORT ANALYSIS OF A PROBLEM IN HEMINGWAY'S "THE SNOWS OF KILIMANJARO," AND A LONG, PHILOSOPHICAL ANALYSIS OF MANN'S MORAL IMPLICATIONS IN "MARIO AND THE MAGICIAN." FOR SIX OTHER DIFFICULT STORIES, PARTIAL ANALYSES HAVE BEEN INCLUDED. EACH "PARTIAL" ANALYSIS IS INTENTIONAL.

MC-D .438 .513 .306 .379

SOMETIMES GREAT HISTORY IS MADE SUDDENLY AND DRAMATICALLY. SOMETIMES IT ENTERS OUR LIVES ON TIPTOE, ALMOST WARILY. IN MANY INSTANCES, MEN LOOK BACK LATER, SEEING FOR THE FIRST TIME THE IMPORTANCE OF SUCH MOMENTS. THUS, FEW PERSONS WERE EXCITED WHEN MAN FIRST SPLIT THE ATOM.

PROBABLY THE FIRST POWER MAN LEARNED TO CONTROL WAS THAT OF MANPOWER. THEN HE TAMED AND TRAINED ANIMALS AND SECURED GREATER POWER, SUCH AS HORSE-POWER AND ELEPHANT POWER. NEXT HE EVOLVED STEAM POWER BY BURNING WOOD AND COAL. THEN HE LEARNED HOW TO GET POWER FROM DYNAMITE AND FROM BURNING KEROSENE AND GASOLINE. WHEN MAN LEARNED HOW TO SPLIT THE ATOM AND CONTROL ITS POWER, HE HAD AT HIS BIDDING A POWER FAR, FAR GREATER THAN ANY HE COULD HARNESS FROM BURNING WOOD, COAL, AND GASOLINE. FINALLY, ATOMIC FUSION, WHICH TAKES PLACE IN THE HYDROGEN BOMB, PROVIDES A MUCH GREATER POWER THAN ATOMIC FISSION PROVIDES.

G .348 .489 .239 .328

THAT WE ARE AS YET QUITE IGNORANT OF EVEN THE SIMPLEST RELATIONS BETWEEN DIFFERENT ODORS IS ABUNDANTLY EVIDENT FROM THE CURRENT UNCERTAINTIES REGARDING THEIR CLASSIFICATION. MANY THOUSANDS OF DIFFERENT SCENTS CAN BE DISCRIMINATED; JUST HOW MANY IS NOT KNOWN. AND WITH EACH PASSING DAY THE ORGANIC CHEMIST IS ADDING NEW ONES. IT IS QUITE POSSIBLE, HOWEVER, THAT ONLY A FEW ELEMENTARY ODORS ARE NEEDED TO ACCOUNT FOR THE WHOLE RANGE OF POSSIBLE SMELLS. THE SITUATION MAY BE MUCH AS IT IS IN THE CASE OF COLOR, WHERE THREE PRIMARIES ARE SUFFICIENT TO SYNTHESIZE THE TOTAL GAMUT OF VISIBLE HUES. WERE WE AS CERTAIN OF THE FACTS OF ODOR MIXTURE AS WE ARE THE FACTS OF COLOR MIXTURE, WE SHOULD BE ABLE TO APPROACH WITH CONFIDENCE SUCH PROBLEMS AS THOSE OF ODOR SPECIFICATION AND FLAVOR ANALYSIS. AS MATTERS NOW STAND OUR INFORMATION ALONG THESE LINES IS AT BEST CHARACTERIZED AS SKETCHY.

L .347 .484 .255 .345

IN SOME LARGE AND OBVIOUS SENSE THE AUTHOR MUST ALWAYS BE THE SUPREME AUTHORITY, SINCE IT IS ONLY THROUGH HIM THAT WE PENETRATE INTO THE WORLD THAT HE HAS CHOSEN TO SET BEFORE US. BUT THE GENERAL STATEMENTS ABOUT AUTHORITY IN FICTION ARE WITHOUT VALUE TO EITHER READER OR WRITER. THE AUTHOR'S LEGITIMATE AUTHORITY LIES NOT IN HIS TELLING US THAT THE SCENE IS SUCH, THAT THESE PEOPLE DID CERTAIN THINGS, THAT WHAT THEY DID MEANT THIS OR THAT; IT LIES RATHER IN CONVINCING US THAT THE SCENE, THE CHARACTERS, THE MEANING, ALL MOVE TOGETHER IN A DYNAMIC PATTERN THAT WE CAN BELIEVE IN APART FROM THE AUTHOR'S PERSONALITY. THE AUTHOR'S PROBLEM IS TO NOT STAND BETWEEN US AND THE OBJECT OR PERSON THAT HE WISHES US TO SEE. THIS PROBLEM REMAINS THE SAME EVEN WHEN THE "AUTHOR" PUTS HIMSELF INTO THE STORY AS FIRST-PERSON NARRATOR OR AS OMNISCIENT NARRATOR.

Ab .330 .476 .224 .339

SENSORY DISORDER HAS MENTAL EFFECTS ON THE PERSON SIMILAR TO THOSE OF BODILY MALFORMATIONS. THE PERSON IS EXCLUDED FROM FULL ADVANTAGE OF CERTAIN PHASES OF LIFE. IF ONE OF HIS SENSES IS DEFECTIVE, HE DOES NOT PERCEIVE AS NORMAL PERSONS DO, HIS SENSORY CONTENTS BEING LIMITED OR DISTORTED. HE IS THEREFORE LIMITED WITH RESPECT TO THE MATERIALS FOR HIS MORE COMPLEX MENTAL LIFE. THINKING DEPENDS UPON SENSE PERCEPTION, AND SENSE DATA WHICH YOU CANNOT PERCEIVE, YOU CANNOT THINK ABOUT. THE SERIOUSLY COLOR BLIND MAN CANNOT KNOW THE WORLD OF COLORS AS OTHER PERSONS DO. HIS ESTHETIC APPRECIATIONS ARE LIMITED BY HIS DEFECT. THE DEAF PERSON MAY SUFFER EVEN MORE. NOT ONLY DOES HE FAIL TO PERCEIVE THE RICH CONTENT OF SOUNDS WHICH NORMAL PERSONS PERCEIVE, BUT HE MAY BE PRECLUDED FROM RECEIVING INFORMATION CONVEYED BY THE SPEECH OF OTHER PERSONS. THE TOTAL EFFECTS OF THESE LIMITATIONS VARY FOR DIFFERENT INDIVIDUALS.

MC_D .462 .458 .287 .400

LONG BEFORE THE DAYS OF PRINTING, MINSTRELS WANDERED FROM CASTLE TO CASTLE SINGING BEFORE KINGS AND THEIR RETAINERS. THEIR SONGS WERE USUALLY ABOUT THE CHARACTER AND THE BRAVE DEEDS OF A REAL HERO. OFTEN THESE MINSTRELS, THESE "GLEEMEN," USED THEIR IMAGINATION AND ADDED MYTHICAL DEEDS. NO ONE AT THAT TIME ATTEMPTED TO WRITE DOWN ANY OF THESE TALES, FOR FEW KNEW HOW TO WRITE. THE STORIES WERE ORIGINALLY HANDED DOWN BY WORD OF MOUTH, VERY MUCH IN THE SAME WAY AS WERE THE LEGENDS OF THE AMERICAN INDIANS. BUT ABOUT A.D. 700 THE STORIES RELATING TO THE BRAVE DEEDS OF A HERO, BEOWULF, WERE COLLECTED BY SOME ANGLO-SAXON POET OF THE TIME. THIS POEM HAS SINCE BEEN TRANSLATED INTO MODERN ENGLISH AND TODAY WE CAN ENJOY READING THE FIRST EPIC POEM IN ENGLISH LITERATURE. BEOWULF FOUGHT TWO DREADFUL FIGHTS TO SAVE A KING AND ONE TO SAVE HIS OWN PEOPLE.

H .317 .453 .232 .273

A THEORY IN SCIENCE SERVES TO BRING ORDER AND MEANING INTO A PARTICULAR REALM OF EVENTS. THE TASK OF ORDERING A SET OF EVENTS CONSISTS IN DISCOVERING RELATIONS AMONG THEM, OR, AS WE SAY, IN FINDING EMPIRICAL LAWS. IN THE INITIAL PHASES OF SEARCH WE EMPLOY THE PROCESS OF INDUCTIVE GENERALIZATION FROM OBSERVATION AND EXPERIMENT. IN THE PHYSICAL SCIENCES THIS PROCESS IS STRAIGHTFORWARD, FOR THE SCIENTIST IN THIS AREA IS ABLE TO ARRANGE FOR SIMPLE SYSTEMS OF OBSERVATION THAT PERMIT ISOLATION AND CONTROL OF A RELATIVELY SMALL NUMBER OF VARIABLES. UNFORTUNATELY THE BEHAVIOR OF LIVING ORGANISMS DOES NOT YIELD SO READILY TO SIMPLIFICATION AND CONTROL. THE GREATER COMPLEXITY OF PSYCHOLOGICAL PHENOMENA MAKES DIFFICULT, IF NOT IMPOSSIBLE, THE EXPERIMENTAL ISOLATION AND MEASUREMENT OF RELEVANT VARIABLES. CONSEQUENTLY PSYCHOLOGISTS HAVE FOUND IT NECESSARY TO GUESS OR THEORIZE MUCH MORE THAN PHYSICISTS HAD TO AT THIS STAGE OF DEVELOPMENT IN THEIR FIELD OF KNOWLEDGE.

H .325 .451 .250 .316

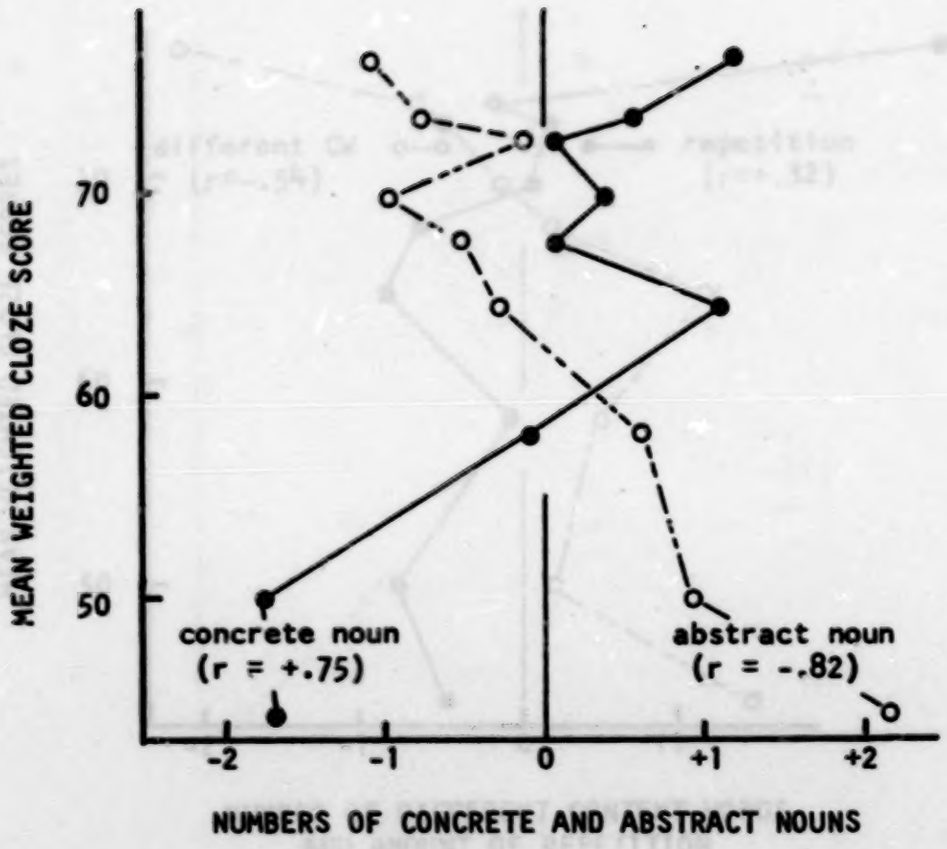
THE MEANINGFULNESS OF THE MATERIALS TO BE LEARNED IS ONE OF THE MOST IMPORTANT FACTORS IN VERBAL LEARNING. WHETHER OR NOT VERBAL MEANING CAN BE IDENTIFIED WITH VERBAL CONTEXT IS A QUESTION THAT IS DEBATABLE, BUT CERTAINLY THE TWO HAVE MANY ASPECTS IN COMMON. WE MIGHT LET THE MEANING REFER TO THE TOTALITY OF CONDITIONS AFFECTING THE VERBAL BEHAVIOR AND RETAIN CONTEXT FOR THE PURELY VERBAL ENVIRONMENT OF THE RESPONSE. WITHIN THE NARROW FRAME OF VERBAL LEARNING EXPERIMENTS, THEREFORE, IT SEEMS REASONABLE TO SPEAK OF NONSENSE SYLLABLES OR DIGITS AS HAVING LITTLE CONTEXTUAL DETERMINATION AND MUCH NEW INFORMATION PER SYMBOL, AND TO SPEAK OF PROSE OR POETRY AS HAVING MUCH CONTEXTUAL DETERMINATION AND LITTLE NEW INFORMATION PER SYMBOL. THE RELATIVE EASE OF LEARNING PROSE OR POETRY REFLECTS A HIGH POSITIVE TRANSFER OF RESPONSE PATTERNS, WHEREAS NEGATIVE TRANSFER IS AT ITS WORST WHEN THE PATTERN OF SYMBOLS IS ARBITRARY OR UNFAMILIAR.

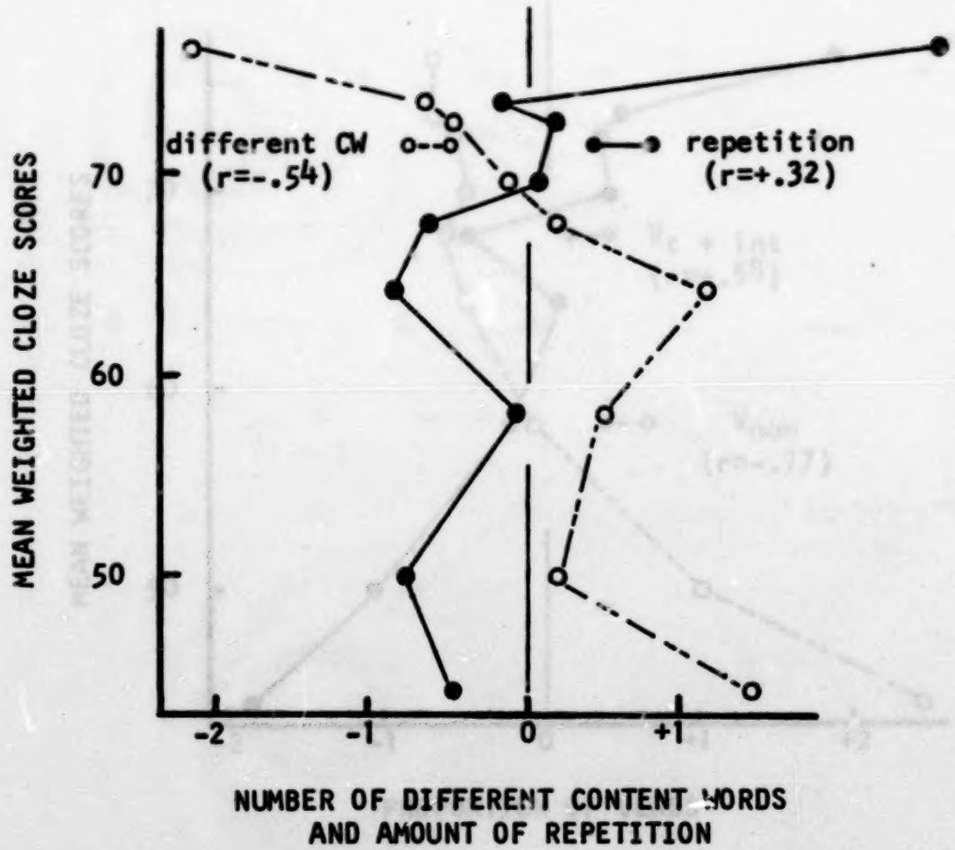
G .227 .433 .185 .270

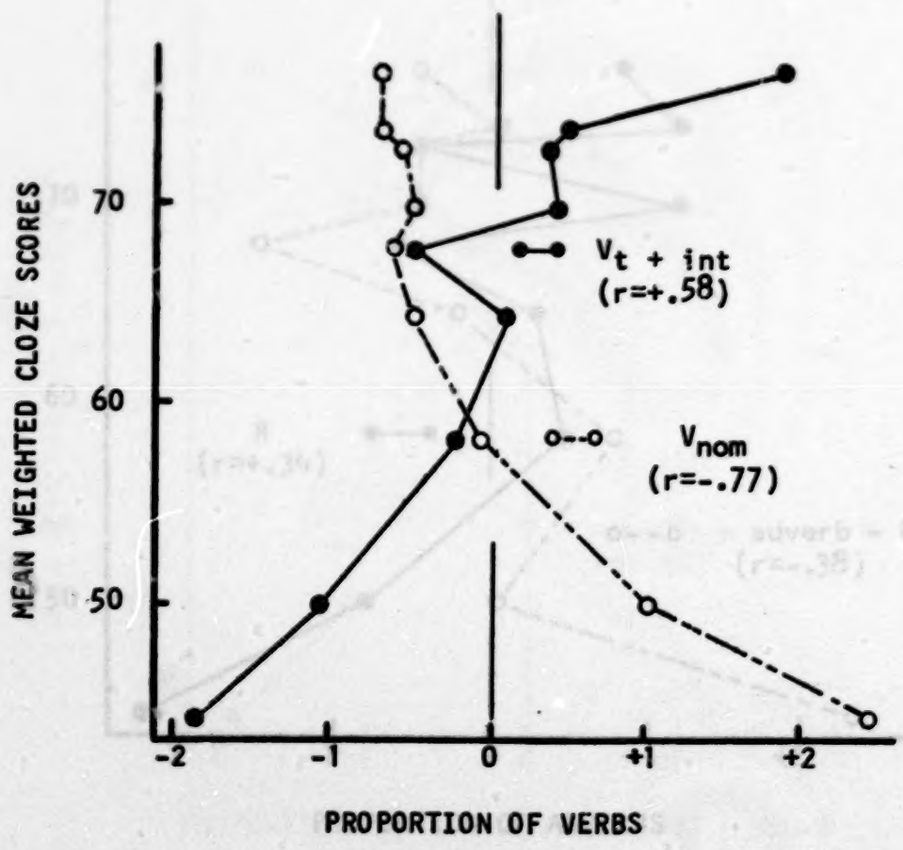
THE MOST RECENT AND THE BEST-CONTROLLED OF THE NERVE DIVISION EXPERIMENTS IS THAT OF LANIER. IN THREE SUBJECTS THE TWO MAIN NERVES (THE LATERAL AND MEDIAN CUTANEOUS ANTEBRACHIALS) SUPPLYING THE VOLAR SURFACE OF THE LEFT FOREARM WERE DESTROYED BY INJECTING THEIR TRACTS WITH 95% ALCOHOL. A CONSIDERABLE REGION CORRESPONDING TO THE PERIPHERAL PROJECTION AREAS OF THE NERVES WAS LEFT ANESTHETIC. THESE AREAS, CAREFULLY LOCATED IN ADVANCE, WERE EXPLORED SYSTEMATICALLY FOR SEVERAL MONTHS BEFORE DENERVATION. THE SAME CARE IN MAPPING WAS USED THROUGHOUT THE 2-YEAR PERIOD FOLLOWING THE OPERATION. INSTRUMENTATION AND PROCEDURE WERE SUCH AS TO GUARANTEE COMPARABILITY BETWEEN SUCCESSIVE TESTS, A MATTER TOO FREQUENTLY OVERLOOKED IN SOME EARLIER WORKS. MOREOVER, QUANTITATIVE MEASURES OF THRESHOLD WERE SECURED BY MEANS OF A CALIBRATED MECHANICAL ALGESIOMETER (PAIN), A "LIMEN GUAGE" (PRESSURE), AND A THERMOESTHESIOMETER (WARMTH AND COLD). ALL FOUR MODALITIES WERE FOUND TO RECOVER CONTINUOUSLY AND GRADUALLY THROUGHOUT THE PROCESS OF NERVE REGENERATION.

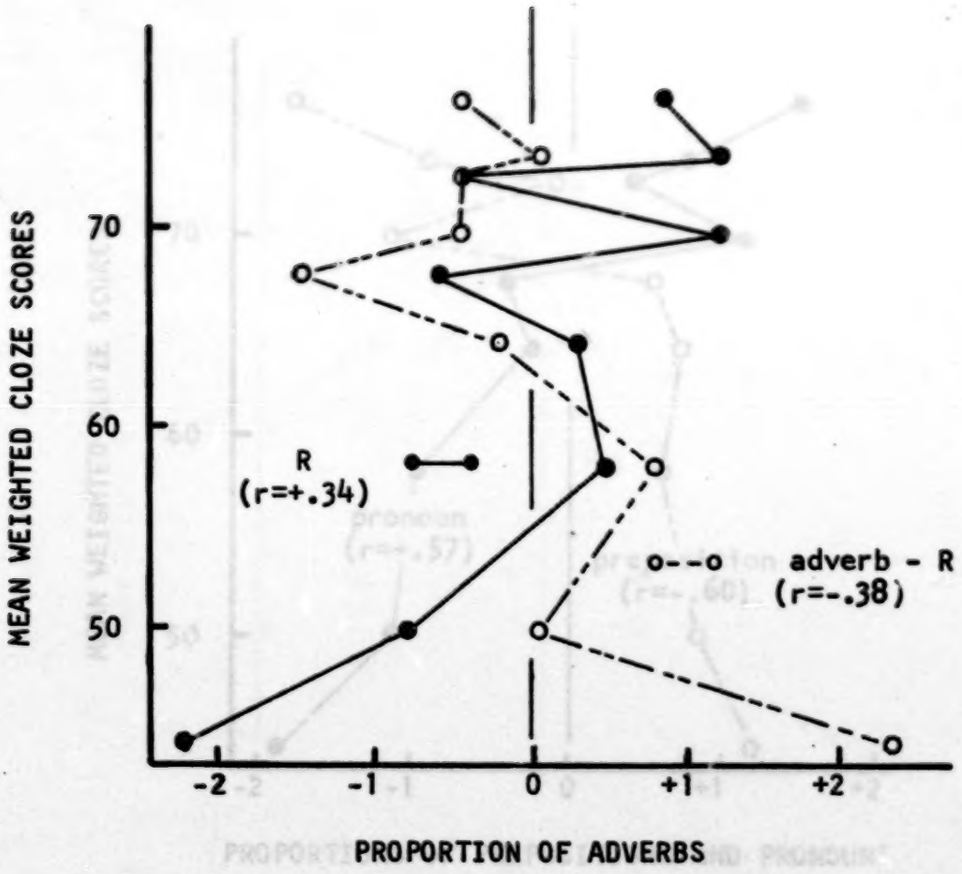
APPENDIX D

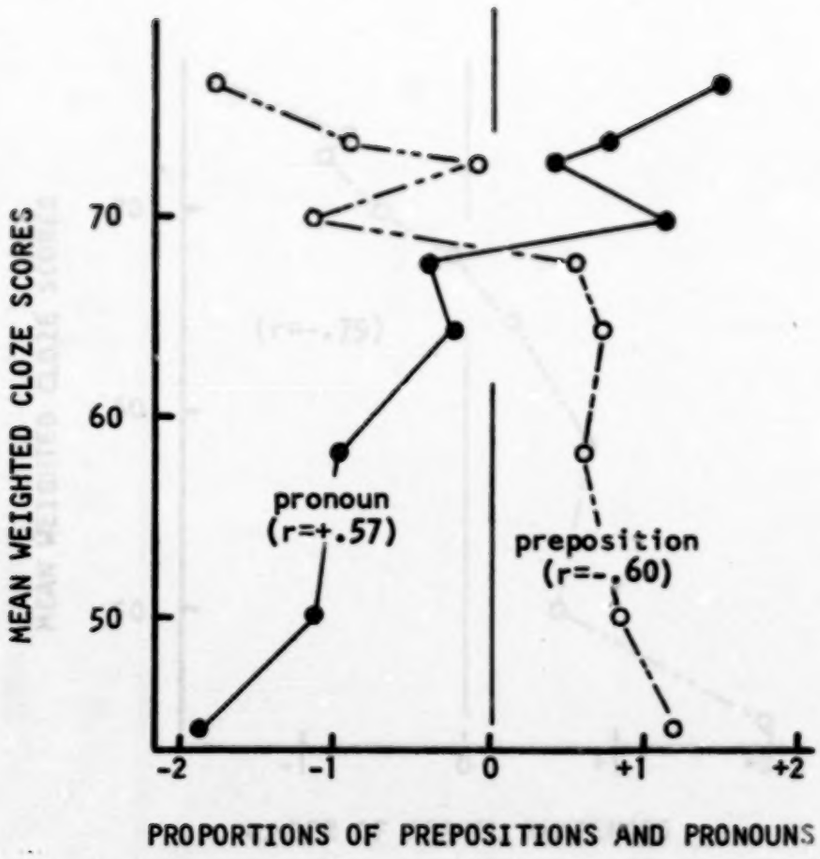
WEIGHTED CLOZE SCORES PLOTTED AGAINST WORD CLASSES

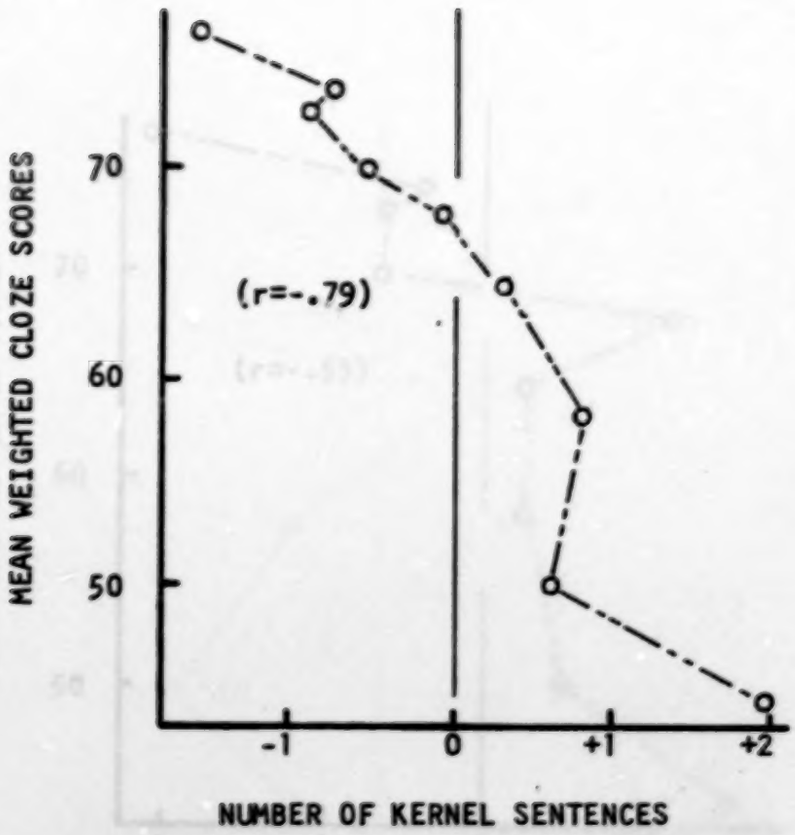

MEAN WEIGHTED CLOZE SCORE
70
60
50
concrete noun
(r = +.75)
abstract noun
(r = -.82)
-2
-1
0
+1
+2
NUMBERS OF CONCRETE AND ABSTRACT NOUNS

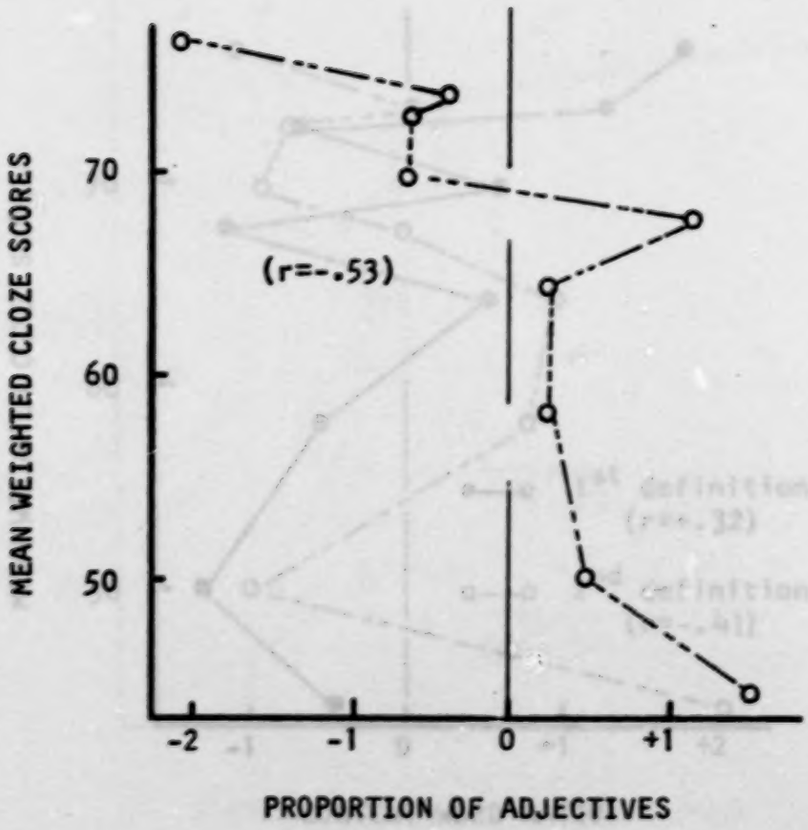

different CW
(r=-.54)
repetition
(r=+.32)
MEAN WEIGHTED CLOZE SCORES
70
60
50
-2
-1
0
+1
NUMBER OF DIFFERENT CONTENT WORDS
AND AMOUNT OF REPETITION

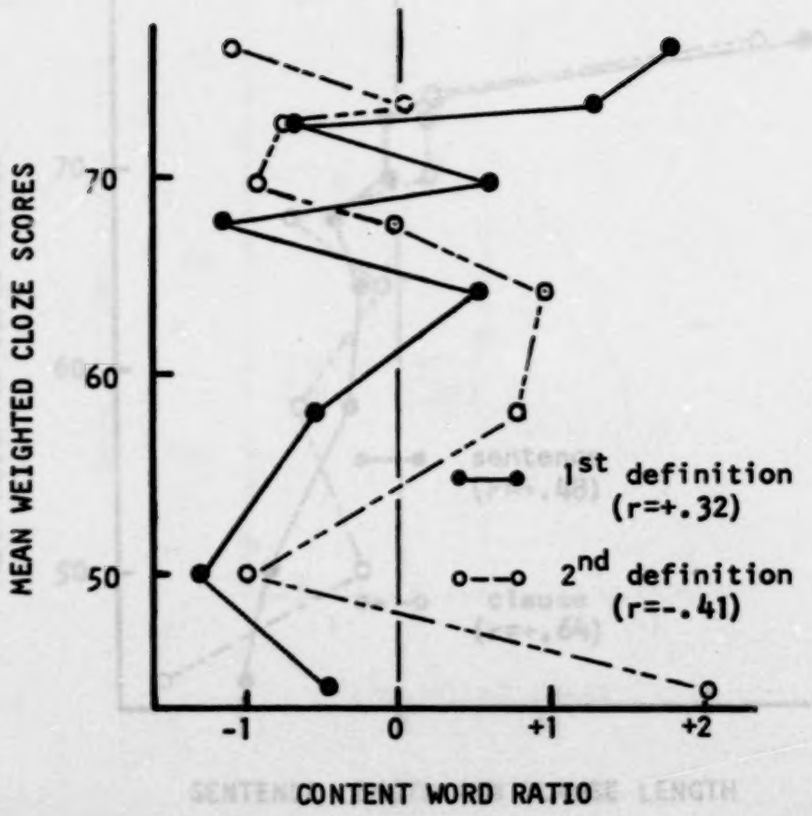

MEAN WEIGHTED CLOZE SCORES
70
60
50
-2
-1
0
+1
+2
PROPORTION OF VERBS
V_t + int
(r=+.58)
o--o
V_{nom}
(r=-.77)

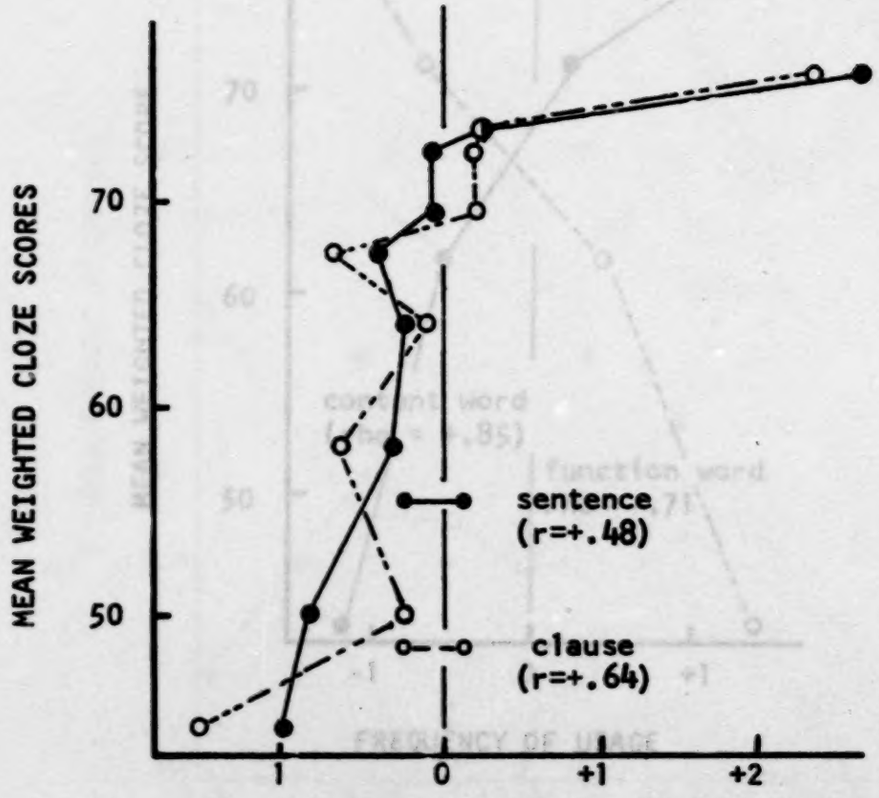

MEAN WEIGHTED CLOZE SCORES
70
60
50
R
(r=+.34)
o--o adverb - R
(r=-.38)
-2
-1
0
+1
+2
PROPORTION OF ADVERBS

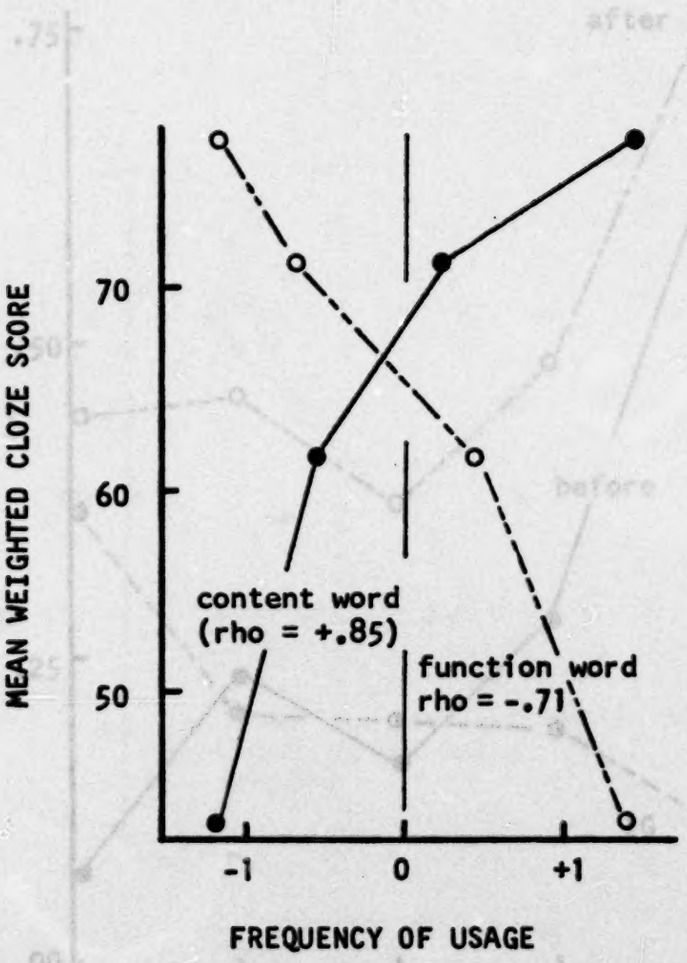

MEAN WEIGHTED CLOZE SCORES
70
60
50
pronoun
(r=+.57)
preposition
(r=-.60)
-2
-1
0
+1
+2
PROPORTIONS OF PREPOSITIONS AND PRONOUNS

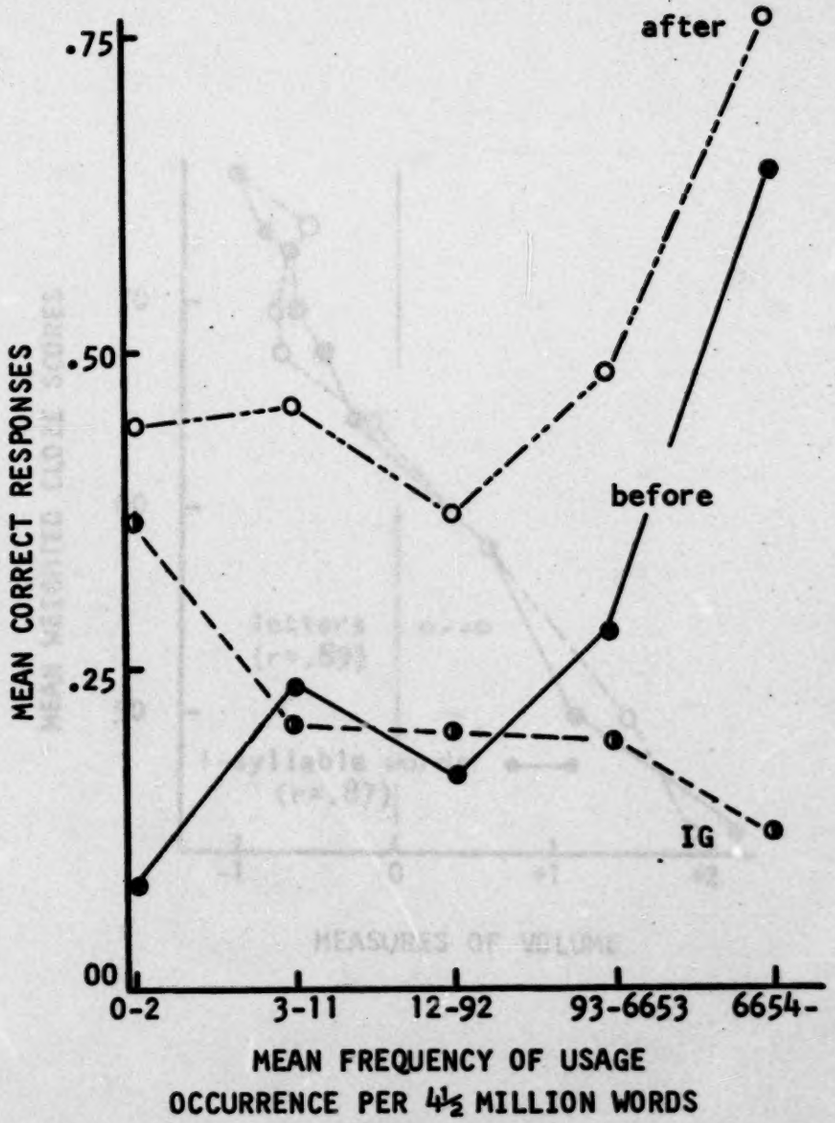

MEAN WEIGHTED CLOZE SCORES
70
60
50
(r=-.79)
-1
0
+1
+2
NUMBER OF KERNEL SENTENCES

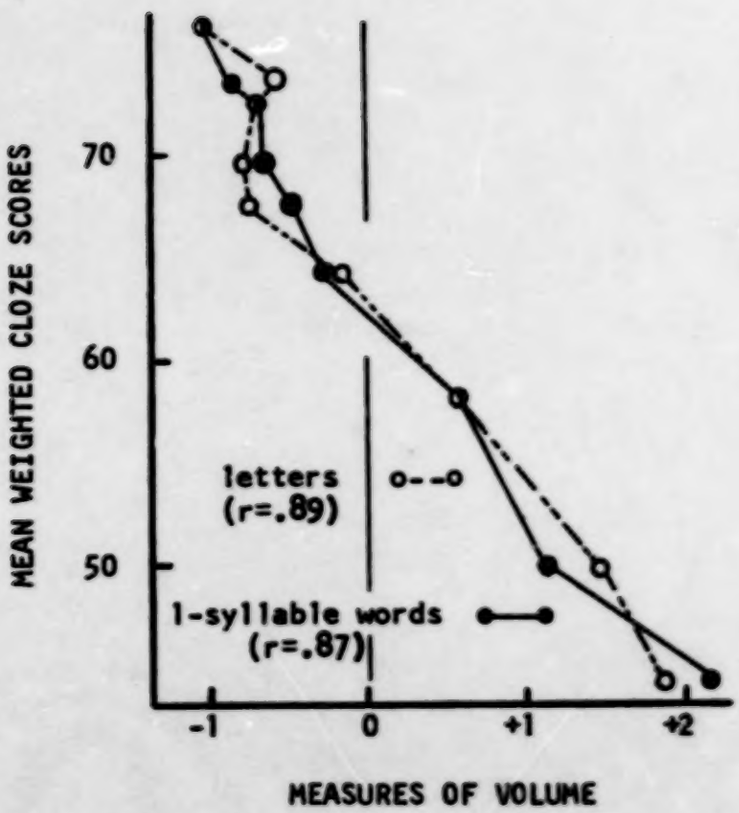

MEAN WEIGHTED CLOZE SCORES
70
60
50
(r=-.53)
-2
-1
0
+1
PROPORTION OF ADJECTIVES


MEAN WEIGHTED CLOZE SCORES
70
60
50
-1
0
+1
+2
CONTENT WORD RATIO
1st definition
(r=+.32)
2nd definition
(r=-.41)


MEAN WEIGHTED CLOZE SCORES
70
60
50
sentence
(r=+.48)
clause
(r=+.64)
1
0
+1
+2
SENTENCE LENGTH AND CLAUSE LENGTH


MEAN WEIGHTED CLOZE SCORE
70
60
50
content word
(rho = +.85)
function word
rho = -.71
-1
0
+1
FREQUENCY OF USAGE


after
before
IG
.75
.50
.25
00
MEAN CORRECT RESPONSES
0-2
3-11
12-92
93-6653
6654-
MEAN FREQUENCY OF USAGE
OCCURRENCE PER 4½ MILLION WORDS


MEAN WEIGHTED CLOZE SCORES
70
60
50
letters
(r=.89)
o--o
1-syllable words
(r=.87)
-1
0
+1
+2
MEASURES OF VOLUME